U.S. DEPARTMENT OF COMMERCE
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PB-260 094

WATER-ORIENTED OUTDOOR RECREATION IN THE LAKE HURON BASIN, MICHIGAN

BUREAU OF OUTDOOR RECREATION
ANN ARBOR, MICHIGAN

PREPARED FOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
CHICAGO, ILLINOIS

OCTOBER 1969

215178

PB 260 094

LAKE HURON BASIN

Water-Oriented Outdoor Recreation

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U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
Lake Central Region Ann Arbor, Michigan

BIBLIOGRAPHIC DATA SHEET

1. Report No.

2.

3. Recipient's Accession No. PB-260 094

4. Title and Subtitle

Water-Oriented Outdoor Recreation in the Lake Huron Basin, Michigan

5. Report Date Oct 69

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

Bureau of Outdoor Recreation, Ann Arbor, Mich.
Lake Central Regional Office.*

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

*Federal Water Pollution Control Administration,
Chicago, Ill. Great Lakes Region.

13. Type of Report & Period Covered

14.

15. Supplementary Notes Report on the Great Lakes-Illinois River Basins Project.

16. Abstracts

Existing recreation resources in the Lake Huron Basin are reported and potential recreation areas are identified. Use pressures on existing facilities and demand for additional developments are determined. Water quality influences on present and future outdoor recreational use are discussed. Objectives for meeting outdoor recreational needs within the basin are established and action and/or programs to increase present and future resource capabilities for satisfying recreation requirements are recommended. The geographic features and socio-economic factors of the basin are described. The demand and supply of present recreation facilities are discussed and future needs are presented. Water quality influences on the recreational aspects of the basin are discussed along with present pollution abatement programs.

17. Key Words and Document Analysis. 17a. Descriptors

17b. Identifiers/Open-Ended Terms

Lake Huron Basin
Michigan
*Recreational facilities
Water pollution abatement
*Water pollution effects(Humans)
Water pollution effects(Plants)
Socio-economic factors
Environmental quality
State planning
Air pollution

17c. COSATI Field/Group 13B

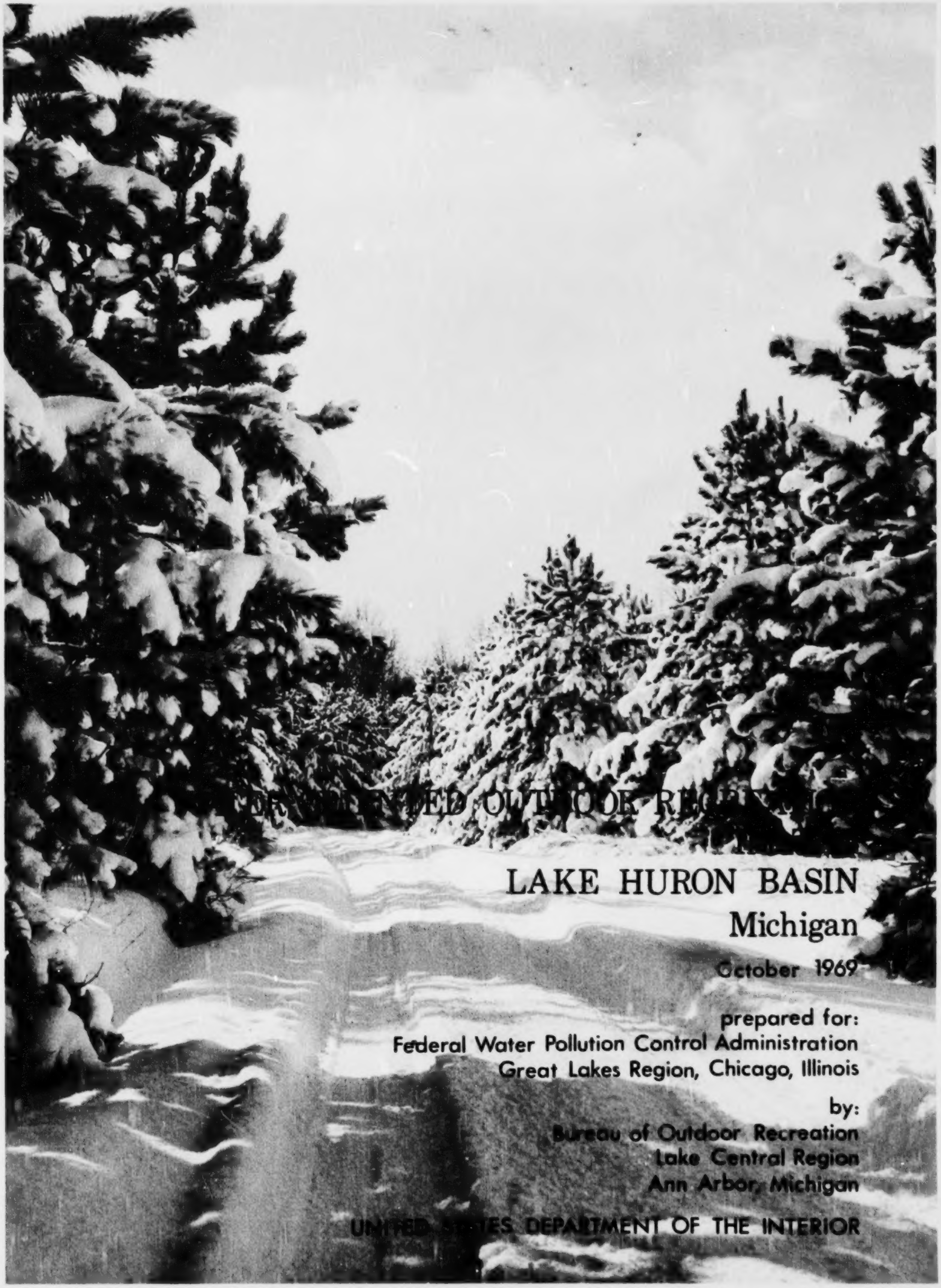
18. Availability Statement

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page) UNCLASSIFIED

21. No. of Pages 190

22. Price



WATER ORIENTED OUTDOOR RECREATION

LAKE HURON BASIN

Michigan

October 1969

prepared for:
Federal Water Pollution Control Administration
Great Lakes Region, Chicago, Illinois

by:
Bureau of Outdoor Recreation
Lake Central Region
Ann Arbor, Michigan

UNITED STATES DEPARTMENT OF THE INTERIOR

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
LAKE CENTRAL REGION
3853 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48104

IN REPLY REFER TO:
D6427GL

October 10, 1969

H. W. Poston, Regional Director
Federal Water Pollution Control Administration
Great Lakes Region
33 East Congress Parkway
Chicago, Illinois 60605

Dear Mr. Poston:

Enclosed is our report on the outdoor recreational aspects of the Lake Huron Basin. This report has been prepared under basic authorization contained in Public Law 88-29, 88th Congress, enacted May 28, 1963, and in response to your request for our participation in the Great Lakes-Illinois River Basins Project.

The Lake Huron Basin supports considerable outdoor recreational use at the present time and possesses sufficient resources to meet many of the future demands for recreational use in the basin if proper planning and development of outdoor recreational facilities are provided. A number of environmental problems do exist in the basin, however. These have the effect of impairing existing outdoor recreational activity and limiting additional recreation use. This report discusses the effects which industrial and municipal pollutants have had on outdoor recreation activity. In one instance, it was determined that the presence of pollutants at a single southern Michigan beach has resulted in a loss of nearly 20,000 swimming occasions annually. Adequate information was not available to assess the loss of swimming participation for the entire basin as a result of low water quality. Similarly, it is impossible to measure the loss of participant satisfaction and enjoyment that occurs in water-enhanced activities, as well as in other water-dependent activities, as a result of water quality impairment.

The presence of considerable algal growths in lakes and streams in portions of the lower basin, the existence of industrial air pollutants near a number of cities, and attendant natural gas vapors associated with oil wells found at several locations inland from Saginaw Bay are all problems affecting the basin's environmental quality. In addition, the large numbers of cottages and seasonal homes utilizing septic tank systems along the shorelines of inland lakes and streams and Lake Huron itself are contaminating the basin's waters to an unknown degree. In many cases, these structures are extremely close to each other and to the water's edge and are impairing the esthetic quality of lake and stream shorelines. They also limit the development of additional public access sites.

Despite these environmental problems, there are indications that some progress is being made. The recent passage of Federal and State water pollution legislation and the establishment of interstate and intrastate water quality standards have laid a foundation for increased control over water pollution. Indicative of some progress in the control of water pollution has been the upgrading of some basin municipal and industrial waste treatment systems. It is still evident that much can be done to improve not only the quality of waters, but the entire environmental landscape of the basin so that a greater degree of leisure time enjoyment can be gained by the outdoor recreating public.

We have appreciated the opportunity to participate in this study, and it is our hope that the findings presented in this report will aid in attaining the highest possible water quality for outdoor recreational use and esthetic appreciation.

Sincerely yours,

Roman H. Koenings

Roman H. Koenings
Regional Director

Enclosure

Foreword

"The pollution of the 1960's stems primarily from our failure as a nation to counter the side effects of our incredibly expanding technology. Some of these problems spill over traditional political boundaries, and we must rightly consider the desirability of regional and federal approaches. We need to develop objective standards of environmental quality and effective, fair means of enforcing them. We need to match advances in technology with advances in government."

Richard M. Nixon
Speech made on May 16, 1968
Portland, Oregon

Syllabus

The United States portion of the Lake Huron Basin lies entirely within the heart of Michigan and comprises 9,100 square miles of water surface and 16,371 square miles of drainage basin land. A moderate climate, 208,000 acres of inland lakes, an 8,800-mile tributary system, and five million acres of forested land all contribute to creating a desirable recreational resource base. The basin is sparsely populated with 1.2 million people. The people are mobile, most have a high school education, and their income is generally below regional averages. Manufacturing employs the largest number of workers, followed by services, trade and sales, governments, and agriculture in that order.

Heavy demands are being placed on recreation resources, particularly in the southern more densely populated portion of the basin. Heavy vacation and nonresident pressures are evident in the northern subbasins. The current annual recreation demand is estimated at nearly 22 million recreation days. By the year 2000 this amount will more than triple, and by 2020 a five-fold increase is anticipated. Approximately two-fifths of the present demand can be attributed to vacation use.

There are 2.5 million acres of land and water in public ownership, of which 14,000 acres are intensively developed for outdoor recreation activities. These public lands are distributed among 257 individual recreation areas with 78 percent providing water-dependent facilities. Discrepancies between supply and demand are most evident in the southern subbasins. Presently there is a need for an additional 17,000 developed acres. Projected requirements for developed recreation lands in the year 2020 are estimated to be nearly 150,000 acres. Large unmet demands for water-oriented facilities emphasize the importance of protecting recreational waters from incompatible uses.

A significant threat to the basin's ability to satisfy future recreation demands is the unregulated proliferation of seasonal and rural residences. A small number of such homes can consume disproportionately large acreages of valuable recreation lands. Existing trends exhibit an increasing demand for this type of development.

Municipal sanitary wastes, industrial processing effluents, and septic tank drains have polluted many of the basin's lakes, rivers, and portions of Lake Huron. Agricultural runoff carrying soils and nutrients has seriously affected aquatic environments and created an esthetically undesirable situation. Every major city and many of the smaller towns and villages in the basin suffer from water quality problems. A single beach located on a 200-acre reservoir in Flint, closed to the public several years ago as a result of inefficient septic systems, results in an annual loss of nearly 20,000 swimming occasions.

Other environment problems are also apparent. The inadequate provision for necessary recreation lands near basin cities, air pollution, an increasing competition for land and water resources among outdoor recreation activities, the destruction of desirable wildlife habitat, and an increasing loss of valuable hunting and fishing lands to private interest groups are some of the more notable examples. These situations could have been avoided and in many instances can be corrected if the basin's resources are managed and developed in a manner cognizant of man's total relationship to his environment.

The Federal Water Quality Act of 1965, Clean Water Restoration Act of 1966, and the Michigan Water Resources Commission Act of 1965 as amended in 1966 provide some of the necessary governmental tools which, when enforced, should abate water pollution problems in the Lake Huron Basin. Public interest and support are needed to encourage the application of necessary enforcement measures which will insure the solving of all types of environmental problems.

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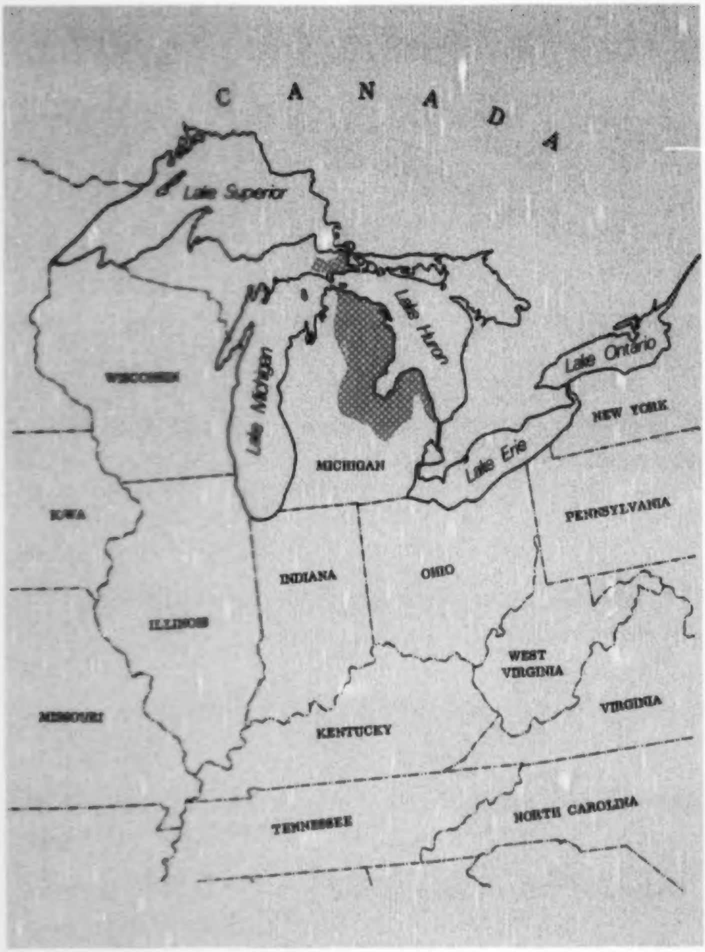

CANADA
Lake Superior
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
WISCONSIN
MICHIGAN
NEW YORK
PENNSYLVANIA
IOWA
INDIANA
OHIO
ILLINOIS
WEST VIRGINIA
VIRGINIA
MISSOURI
KENTUCKY
TENNESSEE
NORTH CAROLINA

Chapter 1
Introduction

AUTHORIZATION

"Water-Oriented Outdoor Recreation in the Lake Huron Basin" was prepared by the Lake Central Region, Bureau of Outdoor Recreation, Department of the Interior, at the request of Mr. William Q. Kehr, Project Director, Great Lakes-Illinois River Basins Project, Great Lakes Region, Federal Water Pollution Control Administration* Department of the Interior, by letter of July 15, 1963. The Bureau of Outdoor Recreation made the study under basic authorization contained in Public Law 88-29, 88th Congress, enacted May 28, 1963.

PURPOSE

This report serves as an appendix to the Lake Huron portion of the Great Lakes-Illinois River Basins Comprehensive Study conducted by the Federal Water Pollution Control Administration. The Bureau of Outdoor Recreation's contribution to this comprehensive project is to plan and coordinate in the development and use of the United States portion of the basin's natural resources in such a fashion that the quantity and quality of outdoor recreation can be optimized. More specifically, the purposes of this study are to; (1) inventory existing recreation resources in the basin, (2) identify proposed and potential recreation areas, (3) determine use pressures on existing facilities and the demand for additional developments, (4) discuss water quality influences on present and future outdoor recreation use, (5) establish objectives for meeting outdoor recreation needs within the basin, and (6) recommend action and/or programs to increase present and future resource capabilities for satisfying recreation requirements. The accomplishment of these objectives will emphasize deficiencies in available recreation opportunities and will provide a framework for the development and improvement of the basin's recreation resources.

---

* Formerly the Public Health Service, Department of Health, Education, and Welfare.

SCOPE

This report considers only water-oriented outdoor recreation within the United States portion of the Lake Huron Basin. For reporting purposes, the following river basins were grouped into three zones:

Zone 1	Zone 2	Zone 3
St. Marys	Tittabawassee	Saginaw
Cheboygan	Shiawassee	Saginaw Bay Tributary
Thunder Bay	Flint	
Au Sable	Cass	

Small streams tributary to Lake Huron north of Iosco County have been included in Zone 1. A reference map delineating the study area is on Plate 2-1.

The inventory of recreation facilities is based on information contained in the Michigan State recreation plan and on data compiled for the Nationwide Plan being prepared by the Bureau of Outdoor Recreation. Emphasis has been placed on public beaches, large marinas, campgrounds, ski resorts, trails, group camps, and other popular recreation facilities. Although hunting and fishing are considered as activities in this report, the Bureau of Sport Fisheries and Wildlife is preparing a report specifically concerned with water quality and its effect on fish and wildlife in the Lake Huron Basin. No evaluation was made of children's playgrounds, amusement parks, and city parks that do not provide facilities for water-oriented recreation.

Projected use is estimated by considering existing, proposed, and potential area developments and their capacity to satisfy a projected demand. Certain areas where low water quality has had significant impact in limiting recreation use are discussed. After the recreation resource needs of the basin have been determined, objectives are formulated, and action mechanisms to implement the objectives are suggested. The views of cooperating agencies have been considered in recommending programs or actions to be taken to improve the basin's water recreation opportunities.

BACKGROUND

In late 1960, after authorization by the Federal Water Pollution Control Act, Section 2(a), Public Law 86-660, the Great Lakes-Illinois River Basins Project was initiated by the Public Health Service. There are three points in the act pertinent to this study: (1) a comprehensive water control program should be developed; (2) it is recognized that the primary responsibility for water pollution control rests with the states and directs that the comprehensive studies be carried out in cooperation with the states and other agencies, both the federal and local; and (3) in the development of such comprehensive programs, due regard shall be given to the improvements necessary to conserve such waters for all uses, including recreation.

Early in 1962 the National Park Service was invited to participate as a cooperating agency in the comprehensive study. It initiated the study on the Illinois River Basin. During the latter part of 1962, its responsibility for the project was transferred to the newly formed Bureau of Outdoor Recreation. The Illinois River Basin study was then completed by the Bureau's Northeast Regional Office located in Philadelphia, Pennsylvania. Due to regional boundary adjustments, responsibility for the remaining portion of the GLIRB project was transferred to the Lake Central Regional Office, Ann Arbor, Michigan. Subsequent studies were completed for the Lake Michigan Basin in October 1965, the Lake Erie Basin in August 1966, and the Lake Ontario Basin in April 1967.

DEFINITIONS

In this report the following definitions are applied to outdoor recreation terminology:

ACTIVITY OCCASION - The participation by one person in one outdoor recreational activity during all or any part of one day. Thus, one person participating in several activities during a day could account for several activity occasions.

COLIFORM COUNTS - An estimate of the most probable number (MPN) of Coli organisms per 100 milliters. Used as an indication of bacteriological contamination.

DAY-USE ZONE - Within a 40-mile radius of the central city of an SMSA.

EFFECTIVE POPULATION - That portion of the total population of the recreation market area which would seek recreation opportunity in the basin.

IMPROVED WATER QUALITY - Water which has been recovered through pollution prevention and abatement measures to the point where its chemical and physical characteristics and esthetic appearance are pleasing to the senses of sight, smell, taste, and feel. In addition, such waters must also have been improved bacteriologically to a condition that permits them to meet criteria for whole body contact water recreational activities.

LATENT DEMAND - That recreation demand which is inherent in the population but not reflected in the use of existing facilities; additional participation which could be expected to occur if adequate facilities are made available.

LOW WATER DATUM - A plane of reference to which design dredged depths and the depths recorded in charts and navigational aids are usually related. The actual levels of the lake surface may be higher or lower than the LWD plane.

OUTDOOR RECREATION - Leisure time activities which utilize outdoor recreation resources and facilities (52)*.

OUTDOOR RECREATION RESOURCES - Land and water resources capable of providing outdoor recreation opportunity (52).

PARTICIPATION RATE - The number of occasions within a given time during which individuals participate in the various outdoor recreational activities as set forth in the Outdoor Recreation Resources Review Commission (ORRRC) Study Report. No. 19.

RECREATION DAY - A visit by one individual to a recreation development or area for recreational purposes during a reasonable portion or all of a 24-hour period. It is assumed that the average person participates in 2.5 activities during an average visit to a recreational area. Therefore, 2.5 activity occasions equal one recreation day.

RECREATION DEMAND - The expression of people's interest in outdoor recreation opportunities.

RECREATION FACILITIES - Developed structures or conveniences for specific outdoor recreation activities in a designated area (52).

RECREATION MARKET AREA - The zone of projected influence from which 80 percent or more of the people are drawn on one-day outings and/or weekend (overnight) trips (58).

RECREATION NEEDS - The difference between demand and supply expressed in terms of resource requirements.

RECREATION RESOURCE AREAS - Those geographic areas having favorable physical features and land use patterns to accommodate extensive recreation development and use (52).

RECREATION SUPPLY - The resources and facilities capable of providing outdoor recreation opportunities.

* Number in parentheses refers to Bibliography in Appendix D.

RESIDENT POPULATION - That population residing within a prescribed geographic area.

RESOURCE REQUIREMENTS - Acres of land and water required to satisfy the recreation needs of the population affecting the study area.

STANDARD METROPOLITAN STATISTICAL AREA (SMSA) - A county or group of contiguous counties which contain at least one city of 50,000 inhabitants or more or "twin cities" with a combined population of at least 50,000. In addition to the county (or counties) containing such a city (or cities), contiguous counties are included in an SMSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city (46). For a more detailed description, refer to the definition reported in U. S. Bureau of the Census publications.

VACATION FARM - A private farm where urbanites may spend a vacation in a rural setting. Income derived from vacationers must supplement farm earnings.

VACATION-USE ZONE - Areas beyond the weekend-use zone (125 miles).

WATER-DEPENDENT ACTIVITY - A recreational activity which could not be carried out without the use of a body of water, water being the essential element to conduct the activity.

WATER-ENHANCED ACTIVITY - A recreational activity which is enhanced by the presence of a body of water but which can be carried out in the absence of water.

WATER-ORIENTED ACTIVITY - An all-inclusive term embracing water-dependent, water-enhanced, and any other outdoor recreation activities in which water augments the recreation experience.

WATER POLLUTION - The addition of any material or any change in quality or character of a body of water which interferes with, lessens, or destroys a desired use.

WEEKEND-USE ZONE - The area between two circles with 40-mile and 125-mile radii having a common center point with day-use zone.

ACKNOWLEDGEMENTS

The Lake Central Regional Office has worked closely with federal, state, and local agencies in the preparation of this report. The compilation of information, statis-

tical data, etc. would not have been possible without the full cooperation of governmental agencies, universities, quasi-public organizations, and private groups. Special thanks are extended to all those who loaned photographs whether or not they appeared in the final report. Although many people with agencies and organizations named below gave willingly of their time to answer questions and to provide information required for this report, they are too numerous to acknowledge individually; but their efforts are gratefully appreciated.

FEDERAL

- U. S. Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- U. S. Department of the Army
  - Corps of Engineers
- U. S. Department of Commerce
  - Weather Bureau
- U. S. Department of the Interior
  - Bureau of Commercial Fisheries
  - Bureau of Sport Fisheries and Wildlife
  - Federal Water Pollution Control Administration

STATE

- Department of Natural Resources
  - Water Resource Commission
  - Recreation Resource Planning Division
  - Michigan Tourist Council
  - Parks Division
- Department of Commerce
  - Office of Economic Expansion

LOCAL

- Genesee County Planning Commission

- City of Flint
  - Recreation and Park Board
  - Department of Public Works
  - Metropolitan Planning Commission

- City of Saginaw
  - Department of Parks and Recreation

- City of Midland
  - Department of Parks and Recreation

- City of Alpena
  - Department of Parks and Recreation

- City of Cheboygan
  - Recreation Department

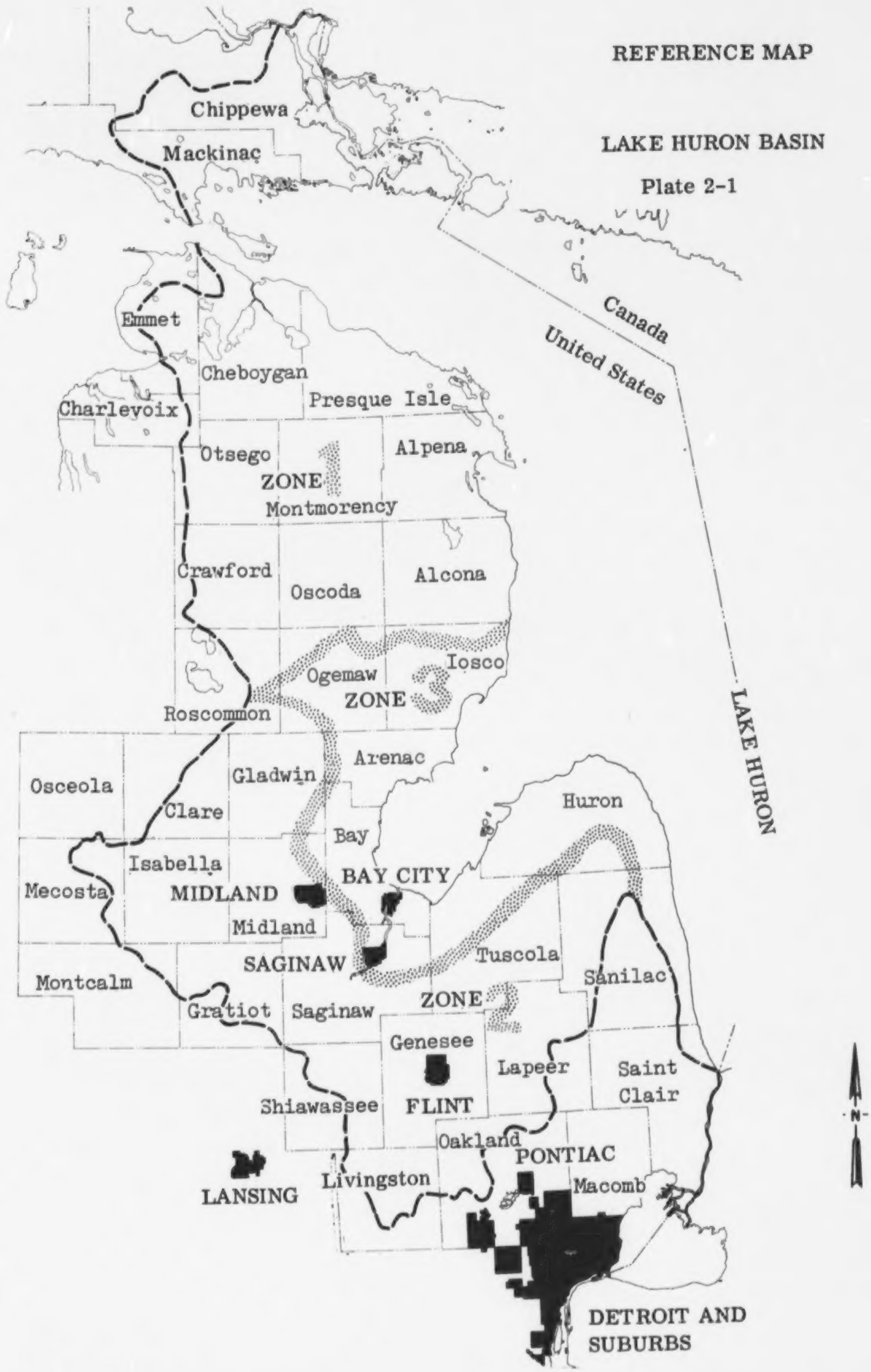
PRIVATE

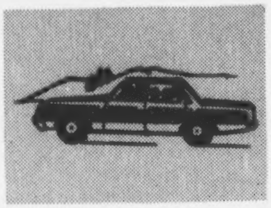
Blintz Fruit Farm
Boyne Mountain
Dow Chemical Company
Flint Journal
Leonard Refineries, Inc.
Otsego Ski Club
The Bay City Times
The Ponemah-Squaw-Tupper Lakes Improvement Association
Thunder Mountain

REFERENCE MAP

LAKE HURON BASIN

Plate 2-1





Chapter 2
General Description

PHYSICAL

Location. The United States portion of the Lake Huron Basin lies entirely within the state of Michigan and comprises 9,100 square miles of water surface and 16,371 square miles of drainage basin land (61). Two-thirds of the eastern half of Michigan and a small section of the Upper Peninsula drain into Lake Huron. The basin has been divided into three zones which are portrayed on Plate 2-1. A description of the location and extent of these zones follows:

Zone 1 encompasses the northeastern portion of lower Michigan and the southeastern tip of the Upper Peninsula. The Cheboygan, Thunder Bay, Au Sable, Saint Marys, Carp, Pine, Munuscong, and Ocqueoc River Basins comprise 7,033 square miles (59).

Zone 2 is located in south central Michigan and contains the Tittabawassee, Shiawassee, Flint, and Cass River Basins. This land-locked area of 6,082 square miles has no rivers which drain directly into Lake Huron (61).

Zone 3 borders Saginaw Bay and includes the periphery of Michigan's agricultural "thumb". With the exception of the Saginaw River, the basins of this zone are drained primarily by small streams and rivers flowing directly into Lake Huron. The zone's total area is 3,256 square miles.

Climate. The climate of the Lake Huron Basin is a Humid Continental-Microthermal type*. Prevailing westerly winds passing over adjacent Lake Michigan have a modifying effect on the Lake Huron Basin resulting in summer and winter temperatures that are more moderate than those experienced by states directly to the west of Lake Michigan. Table 2-1 lists the basin's mean maximum and minumum temperatures for summer and winter months. Winter temperatures are excellent for recreation activities requiring cold but mild conditions. Moderate summer temperatures in the northern portion of the basin tend to restrict water contact sports; however, they attract many recreationists seeking relief from the warm, humid climate to the south.

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* Koppen Climate Classification System.

Table 2-1

MEAN MAXIMUM AND MINIMUM TEMPERATURES FOR SELECTED MONTHS
Lake Huron Basin

Months	Maximum	Minimum
June	74	52
July	80	58
August	78	57
December	32	19
January	28	14
February	30	15

Source: (64)

Precipitation averages 30 inches per year and is distributed over 146 days; the summer months account for 30 of these days. Average annual snowfall in the winter months ranges from 40 inches in the southern portion of the basin to 100 inches in the Sault Ste. Marie area (33). (See Plate 2-2.) Normally summer precipitation hinders outdoor recreation activity, but it should not be assumed that 30 summer days are lost because of rainfall. To qualify as a precipitation day only .01 inch precipitation is required. Rain totaling .02 inch could fall for a two-hour period beginning at 11 p.m. and thereby qualify as two precipitation days. The detrimental effect of this rainfall upon recreation would be negligible. To illustrate this point, precipitation records for 1963 and 1965 from the Alpena, Flint, and Sebewaing weather are averaged and presented in Table 2-2.

Table 2-2

SUMMER PRECIPITATION RECORD FOR THREE WEATHER STATIONS
Lake Huron Basin 1963 and 1965

	In recreation season*	Precipitation Occurred	Percent Precipitation Occurred during recreation season
Number of Days	92	25	27.2
Number of Hours	2,208	96	4.3

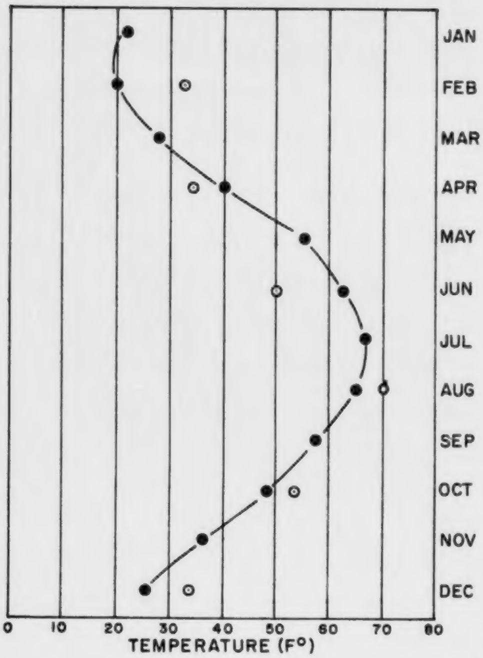
Source: (50)
* Recreation season implies June, July, and August.

MICHIGAN SHORELINE RECREATION CLIMATE

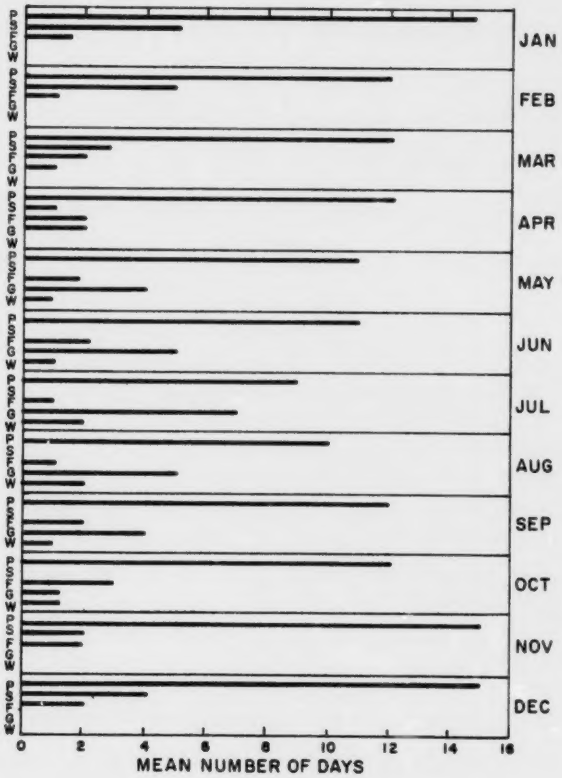
LAKE HURON BASIN

Plate 2-2

WATER AND AIR TEMPERATURES



LIMITING PHYSICAL FACTORS



LEGEND

TEMPERATURES

○ Water Surface (mean monthly)

● Air (mean daily)

PHYSICAL FACTORS
(No bar equals 0 or trace)

P - All precipitation types
S - Snow
F - Fog
G - Wind over 30 mph
W - Waves over 1 ft

Source: (35)

Approximately 50 percent of the summer precipitation occurred between 8 p.m. and 8 a.m. The 50 percent (or 48 hours of precipitation) occurring between 8 a.m. and 8 p.m. is distributed over 1,104 hours (50). This means only 4.3 percent of the summer recreation season is directly affected by precipitation. Therefore, precipitation effects upon outdoor recreation are of small consequence.

The number of days which dense fog occurs annually ranges from 10 days in the vicinity of Port Huron to 20 days in the Mackinac Straits area. This is generally morning fog which burns off shortly after sunup. Winds average from 8 to 10 miles per hour with the greatest velocities occurring along the Lake Huron Shoreline (33). The western Lake Huron shoreline is shielded from the prevailing southwesterly winds by the land mass. This sheltering effect permits greater participation in water-dependent activities along the shoreline.

The Land.

Geology. Like all of the Great Lakes Basins, the Lake Huron Basin is the result of Pleistocene glaciation which shaped its present topography. Physiographically, it is classified as part of the Central Lowlands exemplified by the rather flat terrain of the "thumb" area of Zone 3. In the northwestern portion of the basin, an exception to this general condition occurs where hilly, sandy, morainal uplands predominate.

Flora and Fauna. There are four forest types in the basin and each consists of two or more tree species. Listed below are forest types by zone. (See Plate 2-3.)

Zone 1

1. Birch, Beech, Maple, and Hemlock
2. Spruce and Fir
3. Jack, Red, and White Pine

Zone 2

1. Oak and Hickory
2. Birch, Beech, Maple, and Hemlock

Zone 3

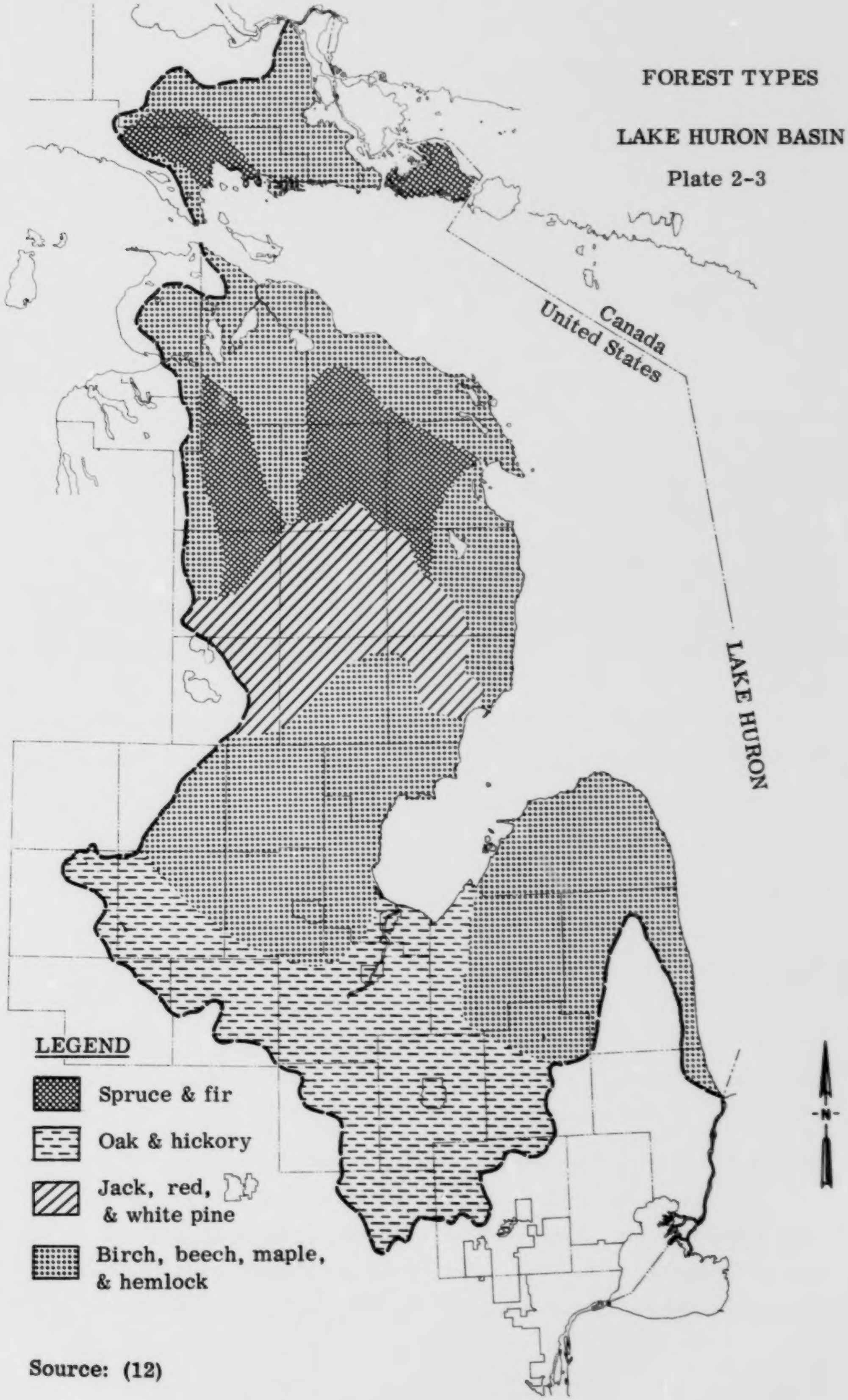
1. Oak and Hickory
2. Birch, Beech, Maple, and Hemlock

Much of the area originally covered with deciduous trees is presently used for agricultural purposes. Those lands with coniferous species were once cut over to facilitate farming but have since reverted to a forested vegetative cover.

FOREST TYPES

LAKE HURON BASIN

Plate 2-3



Source: (12)

Plate 2-4

The majestic elk was successfully reintroduced into the basin and is an attraction to tourists and nature observers in addition to providing restricted hunting. Photo by Mich. Dept. of Conservation.

The basin has a wide variety of wildlife including several species of songbirds, upland game birds, waterfowl, turkey, furbearers, and three big game animals (white tailed deer, elk, and black bear) (21). As a form of recreation, hunting is one of the major uses of wildlife in the basin; however, non-consumptive uses, i.e., photography and wildlife observation, are engaged in by thousands of basin residents and visitors. The basin's inland lakes, rivers, and streams support a wide range of fish species. Commonly found are walleye, yellow perch, bulegill, northern pike, trout, bass, and muskellunge (21).

Lake Huron's Saginaw Bay provides excellent habitat for thousands of ducks and geese and offers hunting and fishing opportunities accessible to the sportsmen of southeastern Michigan. A more intensive treatment of the basin's fish and wildlife composition can be found in the U. S. Bureau of Sport Fisheries and Wildlife report concerning water quality and its effect on fish and wildlife in the Lake Huron Basin.

Plate 2-5

The lowering of lake levels has exposed this rock strewn sediment based wet beach which discourages use of the entire beach area. Photo by Bureau of Outdoor Recreation.

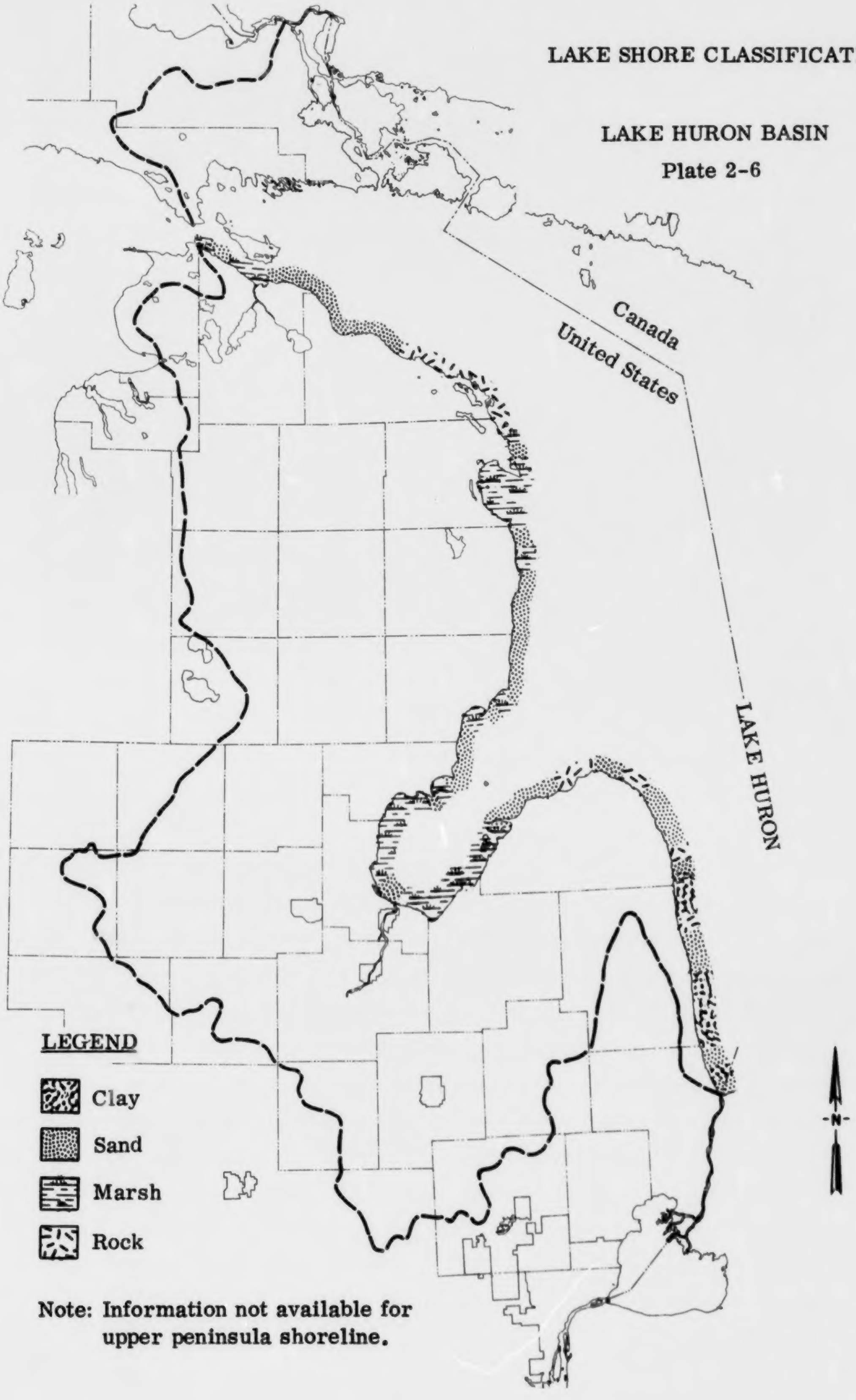
The Water.

Lake Huron. Lake Huron is the second largest of the Great Lakes and its water surface is 23,000 square miles (42). Its surface is 579 feet above mean sea level. Maximum recorded depth is 752 feet; the average depth is 208 feet (43). Lake Huron has more islands than any other inland lake in the world and contains Canada's Manitoulin Island which is reputed to be the world's largest fresh water island (14). Fluctuations in water levels are attributable to three principal causes: precipitation and evaporation, seiches, and lunar tides. Seiches and lunar tides are responsible for short-term fluctuations, whereas variances in precipitation and evaporation occur over a longer time interval. Seiches do not prevail on Lake Huron to the extent or amplitude found in relatively shallow Lake Erie. The lunar tides cause 1 1/2 to 3 inches of variation in the lake level, considerably less than the water displacement caused by seiches. Both seiches and lunar tides are insignificant from a recreational standpoint on Lake Huron.

LAKE SHORE CLASSIFICATION

LAKE HURON BASIN

Plate 2-6



Note: Information not available for
upper peninsula shoreline.

Season fluctuations in Lake Huron water levels averaged 1.17 feet annually during the ten-year period, 1957-66 (44). The low period normally falls in the winter months, December-February, while the high water period occurs during May-July.

Long term fluctuations resulting in high or low water cycles are caused by variations in precipitation over extended periods of time. These fluctuations have a pronounced effect on recreational use of the lake. The lake is presently recovering from the low cycle of 1964 and 1965 when water levels fell below Low Water Datum. During low periods marinas and other boating facilities are often inoperable because water levels are too low to permit boat traffic. During 1952-53 extremely high levels were reached and many recreation facilities, especially those on private lands, were extensively damaged. A study by the Bureau of Outdoor Recreation on the effects of Great Lakes water level fluctuation on recreation is currently under way.

The Shoreline. The United States shoreline of Lake Huron (including islands) is 740 miles in length. Of this total, 564 miles are mainland miles; 45 miles are on the Lake Huron side of Drummond Island; and 131 miles are on other islands in Lake Huron (32). The shoreline is characterized by sand and gravel beaches, marsh, clay bluffs, and sporadic rock outcrops. (See Plate 2-6.) Lake Huron has an exceptionally gradual shoreline relief which is considered desirable for recreational purposes. However, the offshore bottom land areas consist of limestone overlain with erodable glacial material (62). When exposed by low water levels, this physical shoreline characteristic is detrimental to water-dependent activities.

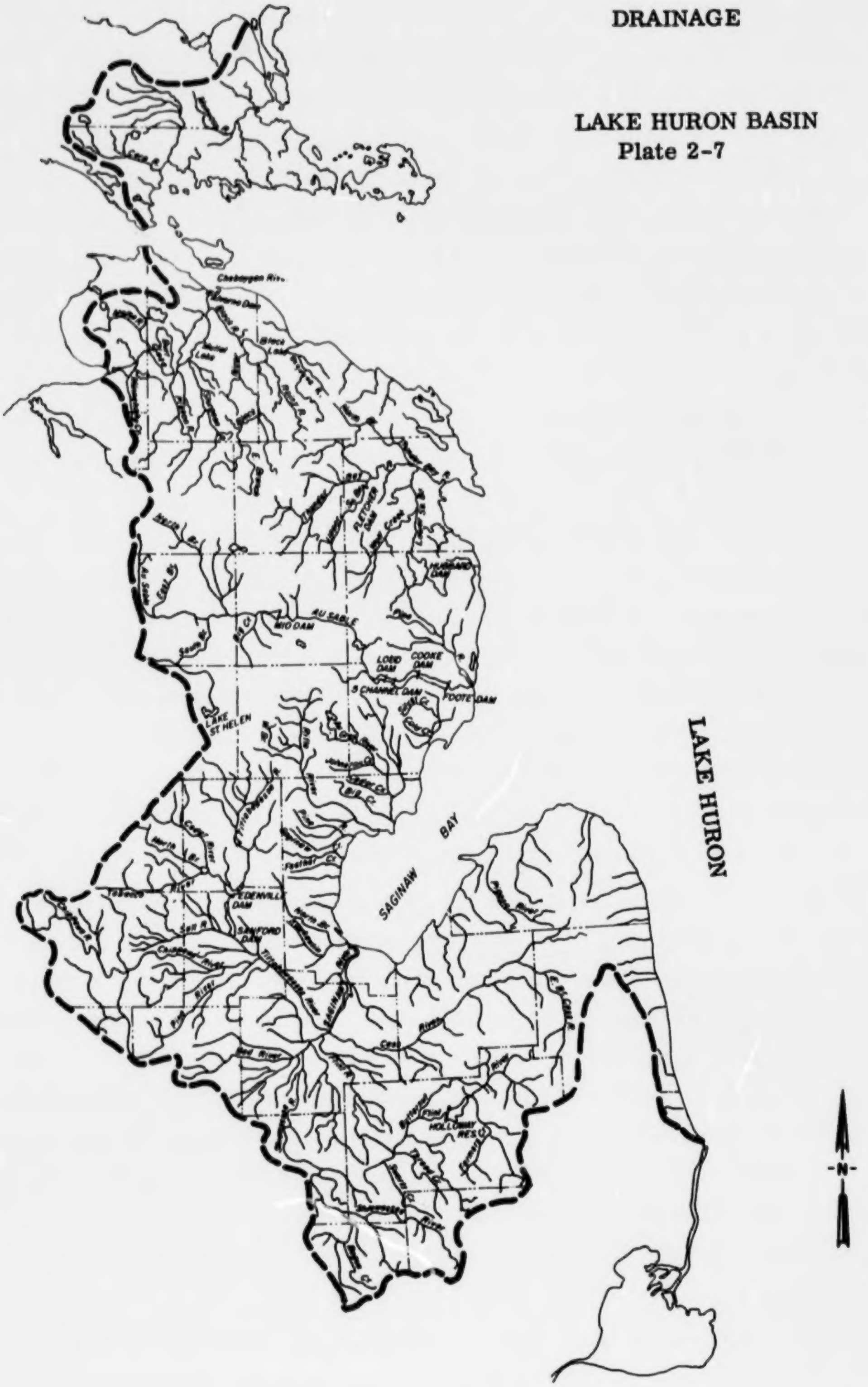
Inland Bodies of Water. The Lake Huron Basin has 208,000 acres (26) of inland lakes and approximately 8,000 miles of streams and rivers. The lakes range in size from thousands of acres to small glacial ponds measuring a tenth of an acre. These waters are heavily used for recreation. Boating, swimming, fishing, and other recreation activities dominate the lakes and the adjoining shoreline. The rivers are generally small due to their shallow drainage basins. Waste assimilations, domestic and industrial water supply, recreation, and power generation are some of the benefits derived from the basin's rivers. This multiple use of the inland waterways causes conflicts generally related to water quantity and quality which will be discussed in Chapter 6.

Land Use.

Urban. Table 2-3 indicates that 5 percent of the basin's land area has been devel-

DRAINAGE

LAKE HURON BASIN
Plate 2-7



oped for urban uses. The major urban and built-up areas are in Genesee, Bay, and Saginaw Counties. Other centers of urban development border the Lake Huron shoreline. This strip development ceases a short distance from the lake and the predominant land uses change to cropland, pasture, or forest. By 1975 it is estimated 280,000 additional acres of land will be needed for urban and construction purposes (25). Where and how this land is developed will be of utmost importance to the basin's future recreational growth.

Table 2-3

LAND USE IN THE LAKE HURON BASIN 1958

	Acres	Square Miles	Percentage
Rural			
Cropland	3,225,000	5,039	30.8
Pasture	583,800	912	5.6
Forest	5,004,500	7,820	47.8
Other*	931,040	1,455	8.8
Subtotal	9,744,340	15,226	93.0
Inland Lake	208,000	325	2.0
Urban & Built-up Areas	525,100	820	5.0
Total	10,477,440	16,371	100.0

Source: (25,26)

* Other land - farmsteads, idle land, wildlife areas, and other areas not classified into cropland, pasture, forest and woodland, and urban and built-up areas. Idle land includes land formerly used for crops and pasture, now abandoned, and not yet reforested or put to other use.

Rural. Michigan's "thumb" and the Saginaw Bay area are the basin's most important agricultural regions. Cropland and pasture account for over one-third of the total basin area. Dairy produce, livestock, and various cash crops including sugar beets, beans, and potatoes are the basin's major agricultural product. Unproductive soils inhibit farming activity in most of Zone 1.

Forest land accounts for over one-half of the land designated as rural and for 47.8 percent of the basin's total land mass. That portion of the land which is forested varies from about 20 percent in Zones 2 and 3 to nearly 85 percent in Zone 1. The pulp and paper industry is the primary consumer of the basin's forest resources. An additional value of these woodlands is the recreational resources.

Recreational. Recreation land use is not directly associated with a separate type of resource base. By their nature, agriculture, forestry, and urbanization are conflicting elements of land utilization. Recreation can be, to a degree, compatible with all three of these uses and is absorbed in the land categories listed in Table 2-3.

Zone 1. Outstanding recreational features of Zone 1 include extensive forests, a multitude of lakes and streams, topography which lends itself to winter sports, and the last vestiges of an undeveloped Lake Huron shoreline. The soils do not lend themselves to intensive agricultural uses, and timber harvests can be conducted in a manner which does not conflict with most outdoor recreation activities. Urban development is not significant and what little does exist is primarily related to recreation.

At the northern end of Lake Huron within Zone 1 lies Drummond Island and its large number of associated scenic islands in Potagannissing Bay. This group of 51 islands and the accompanying waters of Potagannissing Bay contain approximately 114,000 acres offering excellent opportunities for diverse water-based recreational activities on a regional scale. The Bureau of Outdoor Recreation has recently completed a study of the recreational potential of the Drummond Island group as part of the Bureau's special island program.

Zone 2. River valleys, forested areas in the north, and glacial moraines in the southern portion of Zone 2 support heavy recreational activity. The Tittabawassee, Shiawassee, Flint, and Cass Rivers and their tributaries offer a significant recreation resource base. This area is not as esthetically attractive as Zone 1, but the aforementioned rivers possess exceptional potential for recreational development due to their nearness to large concentrations of people. The forested northern section lends itself well to camping, hunting, and other recreation activities that depend upon a natural environment. With the exception of its southern extremity, Zone 2 is largely devoid of natural lakes.

Zone 3. Excepting the shoreline areas of Lake Huron, Zone 3 lacks the natural resource features necessary to provide varied recreational opportunities. The most intensively developed shoreline on Lake Huron lies within this zone. Residential development is prevalent along the southern shore but seldom extends more than one-quarter mile inland from the lakeshore. Portions of Saginaw Bay are marshy and support large numbers of waterfowl. Bay waters also sustain a popular Great Lakes sport fishery. Since there are few inland lakes in this zone, Lake Huron is used extensively for recreational boating.

SOCIO-ECONOMIC FACTORS

Basin Development. The French fur traders were the first white men to enter the Lake Huron Basin. Mackinaw Island was a center for the fur trade industry, primarily because it was near large concentrations of fur bearing animals and furnished access to water transportation. Since the French were only interested in pelts, they made no effort to establish permanent homes in the basin (23).

In 1760, as a result of the French-Indian War, the Lake Huron Basin, among other territories, was placed under British jurisdiction. Like the French, the British encouraged fur trading and dissuaded farming and domestication of the land. The British maintained defacto control of the basin until 1828. Two years later the fur trade reached its peak, thereafter giving way to an expanding lumber industry. Saginaw's location, adjacent to 6,000 square miles of forest land, assured continued prosperity for east central Michigan. Cheboygan, Alpena, and other small communities thrived on the "inexhaustible" supply of white pine. As the land was stripped of trees, immigrant farmers from the east began raising crops and livestock. Those in the southern portion of the basin were usually successful, but the soils in the north were largely unproductive; thereby causing the economic demise of many rural families (13,14).

Through wise resource management, the basin is recovering from these early exploitations. The forests have been reestablished, and agriculture is prospering in those areas suitable for crop and livestock production. In the first half of this century, manufacturing was firmly established as the basin's principal industry. More recently, the natural resources of the basin have been advantageously used to help develop a thriving recreation industry.

Present Economic Foundation. The economic base of the Lake Huron Basin is influenced by a variety of resources and industries. Pulp cutting, gypsum mining, and a chemical industry based on subterranean brine deposits bolster the economy of Midland, Alpena, Alcona, and Presque Isle Counties. Heavy and light manufacturing complexes are located in the three principal cities: Bay City, Saginaw, and Flint.

Adding balance to the economic complexion is a prospering agricultural industry supplying a multitude of food products from the basin's central lowlands. A service industry consisting of restaurants, overnight accommodations, entertainment and recreation facilities, and automobile maintenance centers has grown to meet the demands of local residents and visitors. These four factors complement each other and contribute toward the goal of a stable, prosperous economic foundation.

Population. In 1960 the resident population of the Lake Huron Basin approached 1.2 million (Table A-1, Appendix A). The relative distribution of the basin's population shows that all of the populated counties (greater than 50,000) are clustered in the southern portion and that each county in the northern portion has fewer than 25,000 people except for Alpena and Chippewa Counties. (See Plate 2-8.)

The basin's Standard Metropolitan Statistical Areas (SMSA), Bay City, Flint, and Saginaw, comprise 57 percent of the population. Two counties within the basin lost population during the period 1940 to 1950, and from 1950 to 1960 a decline occurred in two other counties. Three-fourths of the counties gained population at an increasing rate in the 1950-60 decade.

Table 2-4 shows the present and projected population of the Lake Huron Basin. The basin's population is expected to increase 62 percent by 1990 and will nearly triple by the year 2020 (61). Also it is apparent that Zones 1 and 3 will at least double their populations within the 60-year period while Zone 2 is expected to increase 214 percent.

Zone 1 is the basin's largest zone in terms of land area, but it is the least populous. It is estimated that this zone's population percentage will drop from 13 percent to 9 percent of the basin total by 2020. Zone 2, which makes up 37 percent of the basin's land mass, accounts for three-fifths of the population. Zone 3 is the smallest of the three zones with only 20 percent of the basin's land area, and it presently contains 313,000 people or approximately 26 percent of the basin's population. (See Plate 2-9.)

Income. The total aggregate income for the basin in 1960 was approximately 1.6 billion dollars. Manufacturing contributed about 80 percent of this income; mining, agriculture, forestry, recreation, and others supplied the remaining 20 percent (13). The basin's 1960 per capita income of $1730 compares rather unfavorably with that of $2317 for the state of Michigan and $2217 for the nation. Oakland County had the highest percapita income ($2217) in the basin, while Montmorency, located in the

POPULATION DISTRIBUTION
BY COUNTY
1960

LAKE HURON BASIN

Plate 2-8

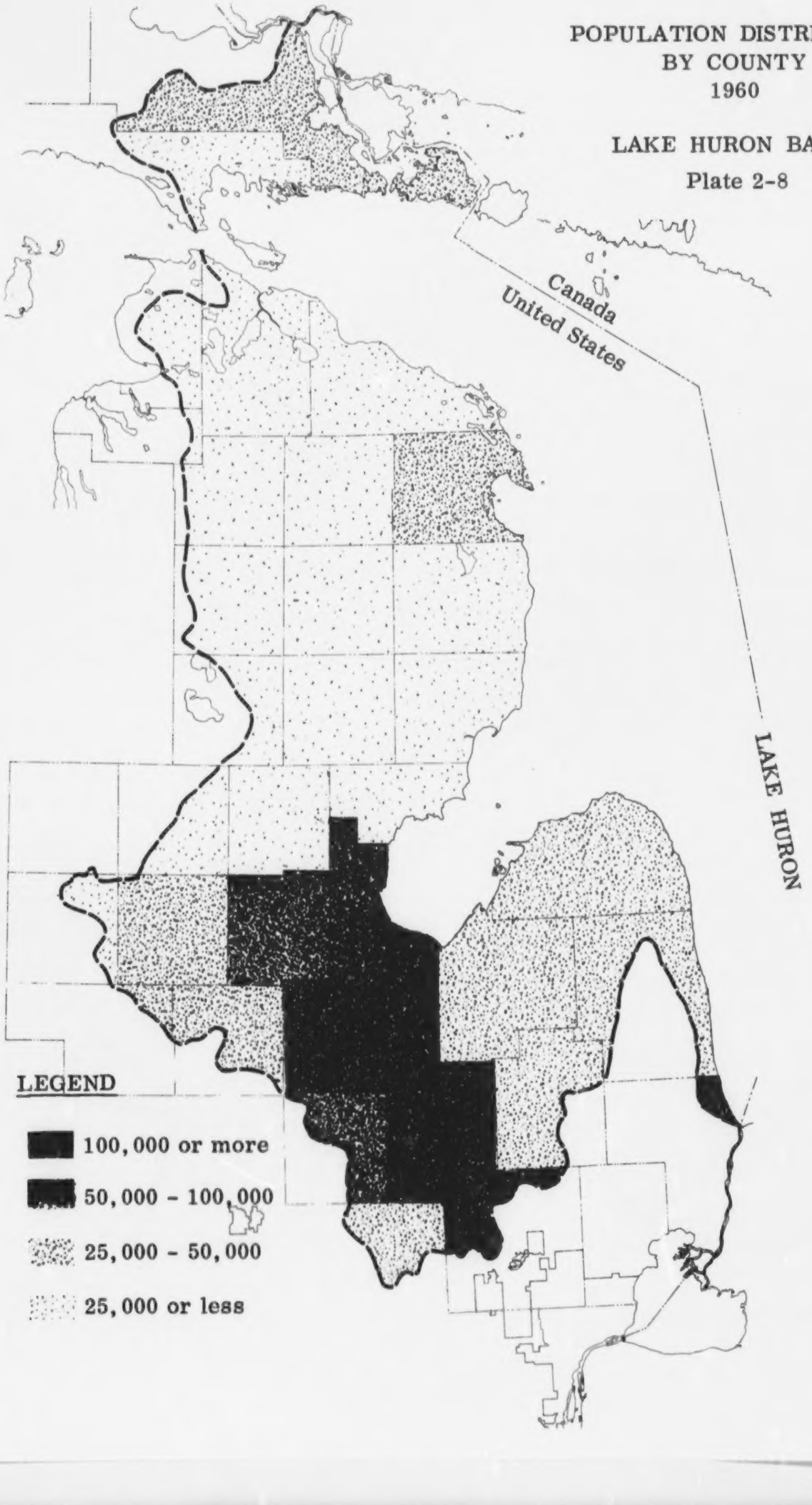


Table 2-4

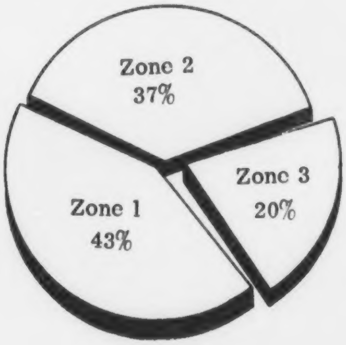
PRESENT AND PROJECTED POPULATION OF THE LAKE HURON BASIN
(in thousands)

	1960	1990	1960-1990 % increase	2020	1960-2020 % increase
Zone 1	152	210	38	304	100
Zone 2	730	1,272	74	2,290	213
Zone 3	313	460	46.9	690	120
Basin	1,195	1,942	62	3,284	174

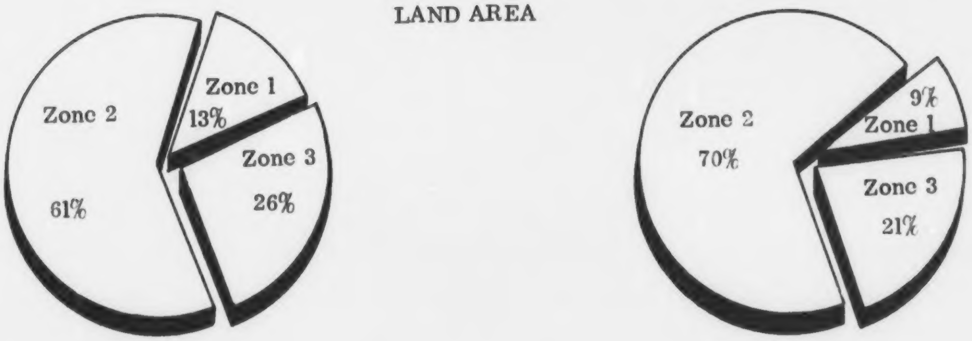
Source: (61)

Plate 2-9

COMPARISON OF LAND AREA AND POPULATION BY ZONE
LAKE HURON BASIN



LAND AREA



1960 POPULATION

2020 POPULATION

forested interior of Zone 1, reported a per capita income of only $1130. Marginal farming, unwise resource utilization, and seasonal employment are factors which contribute to the low per capita income (49). Since income greatly influences the degree to which people participate in outdoor recreation activities, it can be assumed that people of the Lake Huron Basin do not participate in outdoor recreation activities as often as people in the rest of the states of the nation.

Leisure Time. In 1959-60 a national study was made to determine the use of leisure time. Of all leisure time activities selected by each respondent, outdoor recreation activities were mentioned one-sixth of the time. Those responding listed insufficient time as a factor limiting recreational participation more than three times as often as income (37). Clawson (11) estimates that outdoor recreation occupies about 7 percent of our leisure time. The amount of leisure time devoted to outdoor recreation has risen greatly in recent decades and presumably will continue to do so in the future.

Education, income, and age composition are variables which separately or in combination affect the amount of leisure time available and to what degree this time will be devoted to outdoor recreation. Other factors which have a definite effect upon the use of leisure time are occupation, availability of facilities, and place of residence. As indicated in the previous section, the basin per capita income is quite low in comparison to the state and the nation. This indicates that lower than average amounts of leisure time are probably devoted to outdoor recreation. Even though projected income, education trends, and an abundant resource base promise more leisure time in the future, participation in outdoor recreation by residents will still continue to lag behind that of the state and nation.

Mobility. The automobile has proven important both as a source of transportation and a form of recreation. Interstate highways carry large volumes of traffic from origin to destination while single lane scenic roads and parkways can be a destination in themselves. Approximately 110,000 miles of federal, state, county, and local roads comprise the basin's highway network (21). Of this total, 375 miles are an integral part of the nation's interstate highway system. A study by the U. S. Department of Commerce reports that the state of Michigan has proposed that 505 miles of thoroughfare be designated as scenic roads and parkways in the Lake Huron Basin. (See Plate 2-10).

INTERSTATE HIGHWAY SYSTEM

LAKE HURON BASIN

Plate 2-10

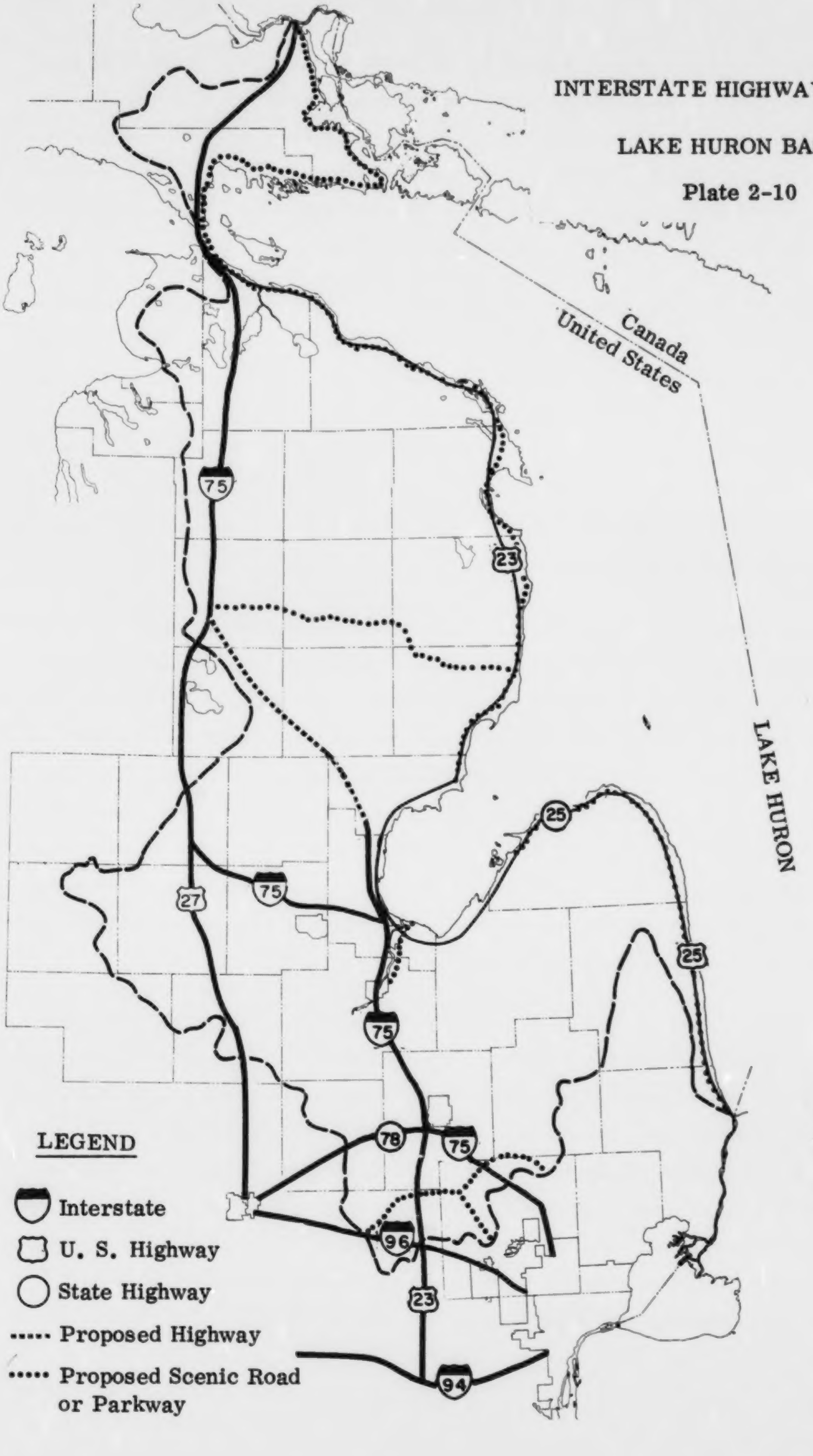


Table 2-5 indicates that the Lake Huron Basin has 0.6 percent of the nation's people and 0.8 percent of the nations' automobiles. Montmorency County has the highest automobile per capita ownership rate with 0.95 cars per person. Saginaw and Isabella Counties share the lowest rate of 0.25 automobiles per person.

Table 2-5

COMPARISON OF NATION-BASIN AUTOMOBILES PER CAPITA (1960)

	United States	Lake Huron Basin	Percent of Nation
Population	179,323,175	1,194,650	0.6
Number of Automobiles	58,258,031	484,000	0.8
Automobiles per capita	0.32	0.40	---

Source: (46)

There are five airports in the basin which accommodate commercial flights, and 54 smaller fields used primarily by noncommercial traffic (21). The size and location of the basin and its excellent highway system have generally precluded extensive air travel for recreation purposes. Intrabasin travel will probably continue this pattern with most transportation confined to ground systems, but interbasin commuting may, with improved facilities, follow national trends of increased air travel.

Other Demographic Characteristics.

Employment. Occupations of the basin's inhabitants provide an indication of their propensity to participate in outdoor recreation. For instance, ORRRC Study Report No. 19 lists participation rates for various outdoor recreation pursuits by industrial employment groups. Plate 2-11 represents the present and future distribution of occupation groups in the basin.

The manufacturing segment presently accounts for two-fifths of the basin's employed population. Although this group will still maintain its lead by the year 2000, it is anticipated that there will be significant gains in services, trade, and sales. The government sector will grow gradually while agriculture and other categories are expected to experience declines. The number of persons engaged in manufacturing will decline relative to the other occupation groups. However, it is estimated that during the next four decades a higher income and a greater amount of leisure time will continue to accrue to those employed in manufacturing: therefore, participation in recreation activities will remain high for this group. According to "Outdoor Recreation for America", the trade and sales group ranks above the average in outdoor recreation participation, and it appears this trend will continue to the year 2000. The expected increase in the size of the services sector, especially the subgroup of professional and technical personnel, indicates that the average income of employees in this sector will rise; thereby increasing the influence of this group on total recreation demand. Agricultural workers make a relatively small contribution to the total demand for outdoor recreation. Government and other categories will exhibit gradual increases in income and leisure.

Urban-Rural Ratio. For comparative purposes, the urban-rural ratio provides an indicator of expected recreation activity by a given population. The ORRRC Studies (34, 36) reveal that urban people are more active in outdoor recreation pursuits than rural people. Furthermore, suburbanites participate more actively than do persons from the central city. As indicated in the preceding section, rural farm residents have the lowest rates of participation. (See Table 2-6.)

The basin's population is expected to nearly double by the year 2000. During this period the rural sector will experience an 8 percent drop in proportion to the total basin's population, although it will gain people in absolute terms. The rural farm segment will also gain residents but will lose in proportion to the urban sector. In 1960 Oakland County had the highest urban-rural ratio (8 to 1) of all counties in the basin. On the other hand, eleven counties had no population classified as urban.*

Table 2-6

PRESENT AND FUTURE URBAN-RURAL RELATIONSHIP
LAKE HURON BASIN

	1960	2000
Population	1,194,650	2,389,000
Percent Urban	63	71
Percent Rural	37	29
Percent Rural Farm**	6	4

**Rural Farm is also included in rural sector.

Source: (38, 47)

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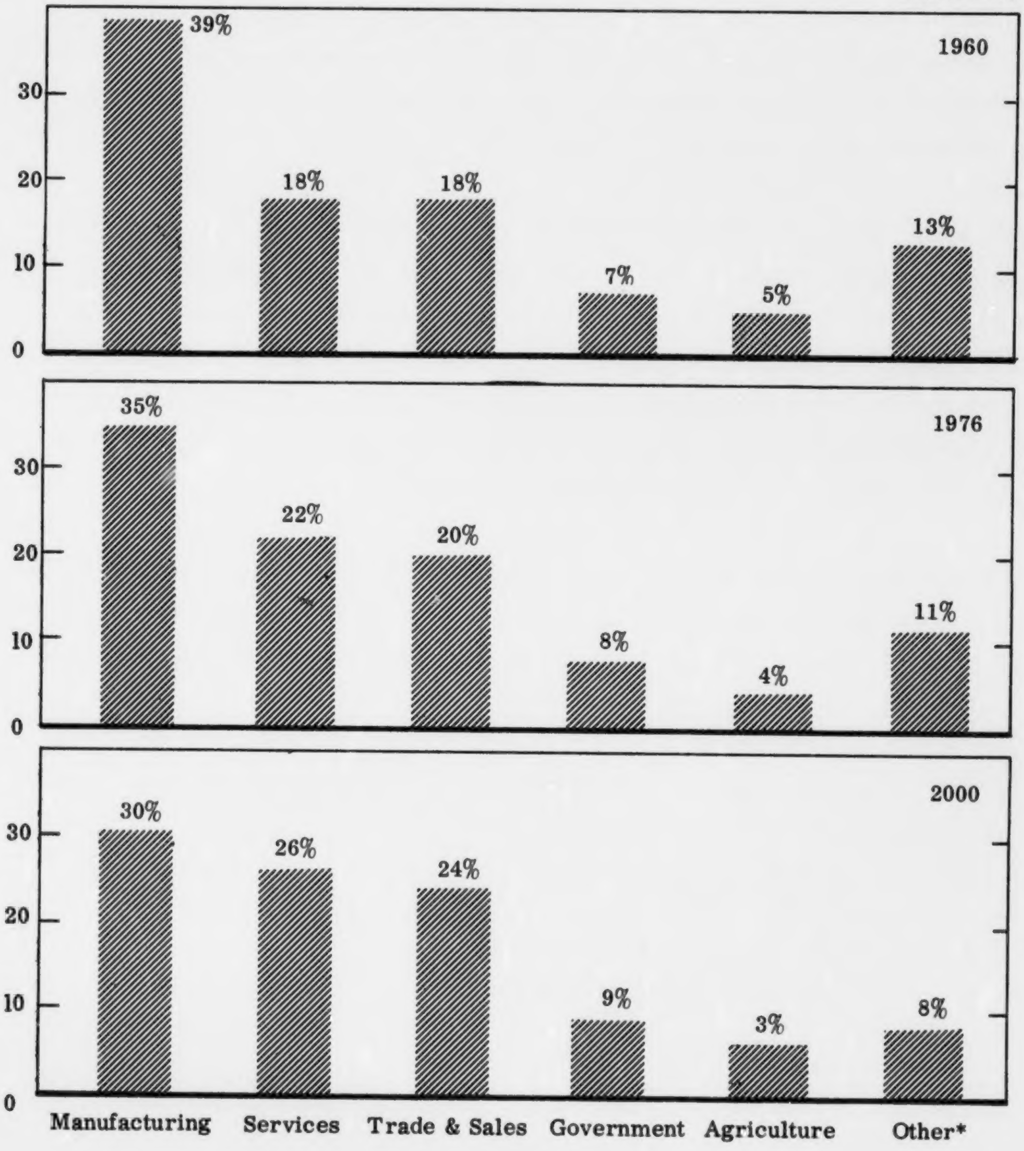
*According to the Bureau of Census definition, an area must contain 2,500 inhabitants or more to be classified as an "urban place". These counties had no incorporated or unincorporated place this size.

PRESENT AND FUTURE DISTRIBUTION OF OCCUPATION GROUPS

LAKE HURON BASIN

Plate 2-11



Source: (38, 47)

*Includes mining, construction, communications, utilities, finance, insurance, and real estate.

Age. Assuming other factors are equal, age has a significant influence on participation in certain outdoor recreation activities. As people grow older, they tend to select less strenous types of recreation activities (34). The Lake Huron Basin has a median age of 26.8 years as compared to the national median of 29.5 years (48). Table 2-7 shows the present and future distribution of age groups in the basin. The 15-34 age group is the most active in outdoor recreation pursuits (36). Table 2-7 indicates that this group will increase in proportion to the total population while the next older category will decline.

Education. Education affects participation in outdoor recreational pursuits in much the same way as income, i.e., the higher the educational attainment, the greater a person's participation tends to be. This is particularly true in the case of swimming, playing games, sightseeing, and walking and driving for pleasure (34). Table 2-8 indicates that the median school years completed for adults in the basin is slightly above the national level. However, the percent of basin adults completing four or more years of college is less than half that of the nation.

Vacationing Population. In 1964 an estimated 1.8 million vacationists came to the Lake Huron Basin for the primary purpose of outdoor recreation (derived in Appendix B). This approximation includes Michigan residents as well as nonresidents. A 1964 study by the Michigan State Highway Department reports that the average trip cost of tourist parties was $116, and the average expenditure per day had approached $25 (24). The average length of stay was 5 days and the average size of party was 3.5 persons (24). The typical tourist:

- Resided in Michigan or one of the neighboring states of Ohio, Indiana, Illinois, and Wisconsin.
- Drove the family car on his vacation trip.
- Liked to view scenery in his travels and especially preferred to follow Michigan's shoreline highways on circle tours of the Great Lakes.
- Made his vacation visit in June, July, or August.
- Preferred motel accommodation in his travels although camping-out is gaining in popularity.

Another segment of the vacationing recreation population to be considered is the summer resident. Approximately 44,000 seasonal vacation homes are located in the basin (21). The largest concentration of these homes is in the counties adjacent to

Table 2-7

PRESENT AND FUTURE AGE DISTRIBUTION
LAKE HURON BASIN

Age Group	1960	2000
Under 15	35%	36%
15-34	26%	30%
35-64	31%	27%
65 and over	8%	7%

Source: (38,48)

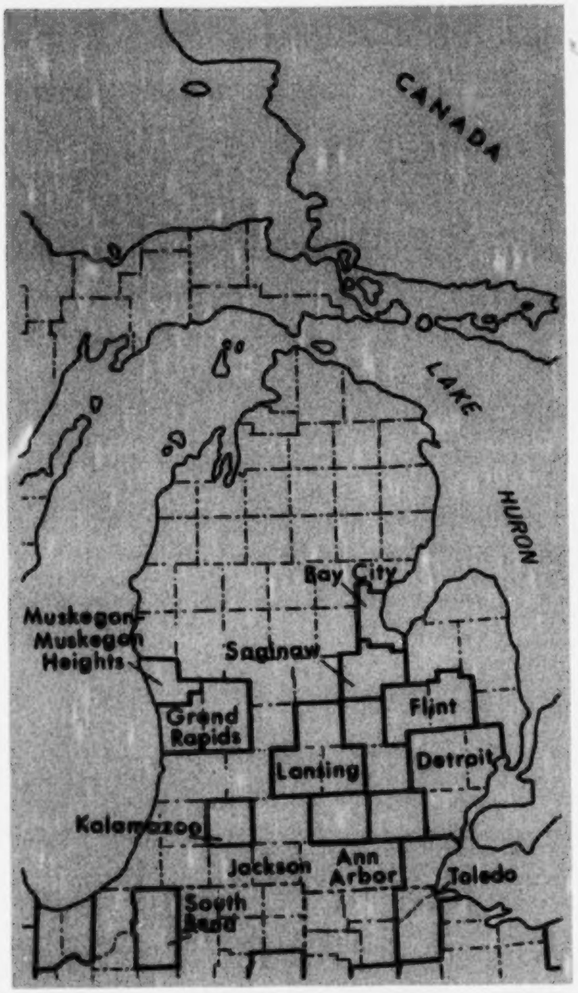
Lake Huron. Iosco County has over 3,200 seasonal vacation homes while Cheboygan, Clare, Huron, Montmorency, Oakland, Ogemaw, and Sanilac Counties have 2,000 or more vacation homes each. Most of the summer cottages and cabins are adjacent to bodies of water.

Table 2-8

COMPARISON OF U.S. - BASIN
LEVELS OF EDUCATIONAL ATTAINMENT-1960
(persons 25 years and over)

	United States	Lake Huron Basin
Median School Years Completed	10.6	10.9
Percent completed one or more years of college	7.7	3.7

Source: (46)



STANDARD METROPOLITAN STATISTICAL AREAS

Chapter 3
Demand

RECREATION MARKET AREA

By definition the recreation market area is that source from which approximately 80 percent of the people are drawn on one-day outings or weekend (overnight) trips to the program area under consideration. For the purpose of this report, the Lake Huron Basin and the SMSA's within a 125-mile radius of its boundaries comprise the recreation market area. The basin itself represents the program area.

METHODOLOGY

Recreation demand is an expression of total participation in general outdoor recreation activities that could be expected if adequate opportunities were available. Demand, therefore, is composed of two elements: (1) the expressed demand represented by use of existing facilities, and (2) the latent or unexpressed demand which is inherent in a population but not reflected in the use of existing facilities. Generally speaking, use records are inadequate or unreliable for many of the recreation facilities operated by local units of government. Latent demand, on the other hand, is not directly measureable because of its dependence on the individual desires of people. Consequently, indirect methods have been used for the measurement of present and future demand (52).

In the analysis of the recreation demand in the basin, it was found that the ORRRC Studies presented the most applicable information. The demand methodology described in Appendix B utilizes participation rates to facilitate estimating the number of occasions a person will participate in various activities during a year. Since participation is at its peak for most water-oriented activities during the summer, activity occasions were determined for the three-month summer period as well.

Outdoor recreation activities considered in this chapter include:

Water-Dependent

- Swimming
- Fishing
- Boating
- Water-skiing
- Canoeing
- Sailing
- Ice Fishing
- Ice Skating
- Snow Skiing
- Sledding
- Snowmobiling

Water-Enhanced

- Camping
- Picnicking
- Sightseeing
- Nature Walks
- Hiking
- Hunting

These activities are obviously not all the recreation activities engaged in, but they represent those considered most important in association with water and water quality.

INFLUENCING FACTORS

Socio-Economic. The present and future demand for outdoor recreation opportunities is dependent upon a number of continually changing socio-economic factors. Carlson et al (10), indicates seven factors that may influence future recreation demands: (a) automation and new sources of power, (b) increased leisure, (c) increased income, (d) greater health and longevity, (e) a higher standard of living, (f) greater mobility, and (g) population changes.

As presented in the preceding chapter, the basin socio-economic factors considered in the recreation demand analysis are population, income, leisure, and mobility. Collectively, these factors have a tremendous impact on demand.

Opportunity. If the opportunity for participation in a selected activity is available, people will tend to participate more than they would otherwise. When opportunity for participation in any of the selected activities exists to some extent somewhere in the basin, the opportunity factor is represented by a time-distance element which is discussed in the demand methodology in Appendix B.

Quality of Facilities. Closely allied with the opportunity factor is the quality of the available facilities. Results of a survey discussed in ORRRC Study Report No. 20 infer that participation in most activities tends to increase in proportion to the quality of the supporting facilities. There are instances, however, where relatively poor facilities receive heavy use because these facilities are the only ones available to the people in the vicinity.

PRESENT DEMAND

There are approximately 54 million recreation activity occasions of demand within the Lake Huron Basin. (See Table 3-1.) Of this annual recreation demand computed for the base year 1960, approximately 67 percent was devoted to summer recreation activities. Water-dependent activities comprise nearly 42 percent of the yearly demand total and about 50 percent of the total summer demand.

The figures shown below are a consolidation of the demand estimates for the modified recreation market area and for the vacation sector. See Tables B-1 and B-2 in Appendix B for a detailed breakdown by activity and by sector. Annual and summer demand by outdoor recreation activities is graphically portrayed in Plate 3-1. Winter activities are shown in Plate 3-2.

Table 3-1

SUMMARY OF WATER-ORIENTED RECREATION DEMAND
LAKE HURON BASIN, 1960

Activity Type	Annual Activity Occasions (1,000)	Summer Activity Occasions (1,000)	Summer as a Percent of Annual
Water-dependent	22,526	18,138	81
Water-enhanced	29,436	18,102	62
Winter sports	2,037	n.a.*	--
Total Water-oriented	53,999	36,240	67

* Not applicable

FUTURE DEMAND

Demand for recreational activities within the basin has been projected to the year 2020. Using ORRRC Study Report No. 26 as a source for future demand projections it was necessary to extend data for the years 1976 and 2000 to obtain projected demand figures for the year 2020. Both "with" and "without" opportunity projections were calculated in order to present a range of probable activity occasions for water-oriented activities. (See Table B-3, Appendix B.) "With" opportunity (as defined in ORRRC Study Report No. 26) assumes an improvement from 1960 quality and quantity of facilities on a per capita basis, while "without" opportunity assumes a continuation of present quality and quantity of facilities. These terms are applied nationwide and are relevant to the specific quality and quantity of facilities offered by public and private agencies within the basin. The use of these terms offers an opportunity to present a range for projecting recreation demand.

Based on the information shown in Table 3 in Appendix B it is anticipated that the summer demand for outdoor recreation activities will increase 2.74 and 3.63 times

DEMAND FOR SELECTED WATER-ORIENTED OUTDOOR RECREATIONAL ACTIVITIES
(Day and Overnight or Weekend)

LAKE HURON BASIN, 1960

PLATE 3-1

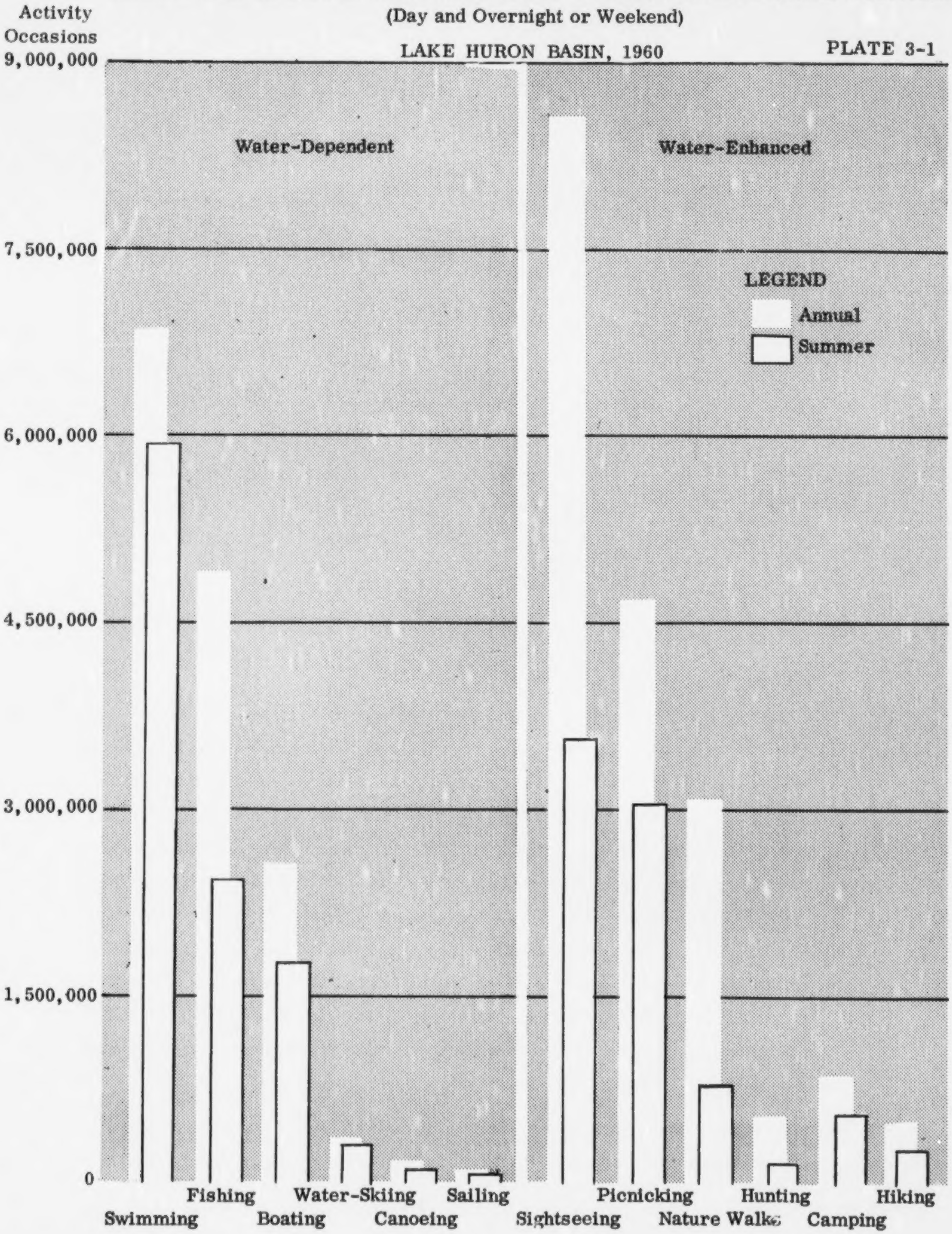


Table 3-2

PROJECTED SUMMER OUTDOOR RECREATION DEMAND
LAKE HURON BASIN

	Activity Occasions (millions)		Index of Change	
Year	Without Opportunity	With Opportunity	Without Opportunity	With Opportunity
1960	19	19	100	100
2000	52	66	274	347
2020	69	90	363	474

Source: Table B-3, Appendix B.

by 2000 and 2020, respectively, providing there will be a continuation of 1960 quality and quantity of facilities. If an improvement in present conditions occurs, the three-month demand will increase 3.47 times by 2000 and 4,74 times by the year 2020. Table 3-2 shows projected demand for the Lake Huron Basin.

ZONE DEMAND

An attempt was made to disaggregate the basin demand for outdoor recreation activities into the three subbasins. A method similar to that used for determining the basin demand was utilized, viz., an income index was derived in order to gain an estimate of the propensity for participation in the respective zones. National forest campground and state park attendance figures, as well as the number of seasonal homes in each subbasin, were also used in determining the demand for each zone. An explanation of this procedure is found in Appendix B. The results of the zone calculations are shown in Table 3-3.

PRESENT ESTIMATED DEMAND
WINTER ACTIVITY OCCASIONS
Lake Huron Basin

Plate 3-2

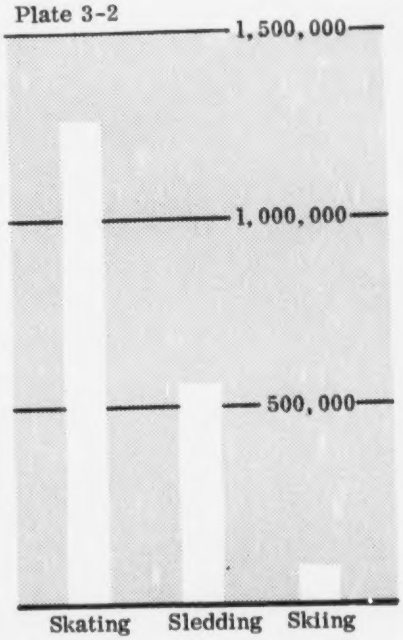


Table 3-3

SUMMARY OF ZONE DEMANDS, 1960
(Activity Occasions - Thousands)

	Market Area Demand	Vacation Demand	Total Demand	Percent of Basin
Zone 1	3,335	9,673	13,008	24
Zone 2	25,665	4,171	29,836	55
Zone 3	7,250	3,905	11,155	21
Basin	36,250*	17,749**	53,999	100

* Total of Column 4, Table B-1
** Total of Column 3, Table B-2

Chapter 4
Supply

PRESENT RECREATION FACILITIES

Public. The Lake Huron Basin has 2,155,447 acres in public forest, park, and wildlife lands. Only .6 percent of the public domain (or .01 percent of the total basin) is developed for recreation pursuits. If access is available, hunting and fishing activities can utilize undeveloped land; but most other recreation activities require facility development, as shown in Table A-1.

In the past, governmental units have used their financial resources for the purchase of land and assumed development could be undertaken at a later date. Today, with the increasing numbers of recreationists and variety of recreational activities, more emphasis is being placed on the development of facilities. However, acquisition still plays an important role in attempting to meet recreation demands. Public programs and resources in the basin provide for almost every form of outdoor recreation. Appendix C provides acreage for visitation statistics, watershed location, and a list of compatible activities for each publicly-owned recreational facility. Plates 4-1 and 4-2 show locations of recreation areas.

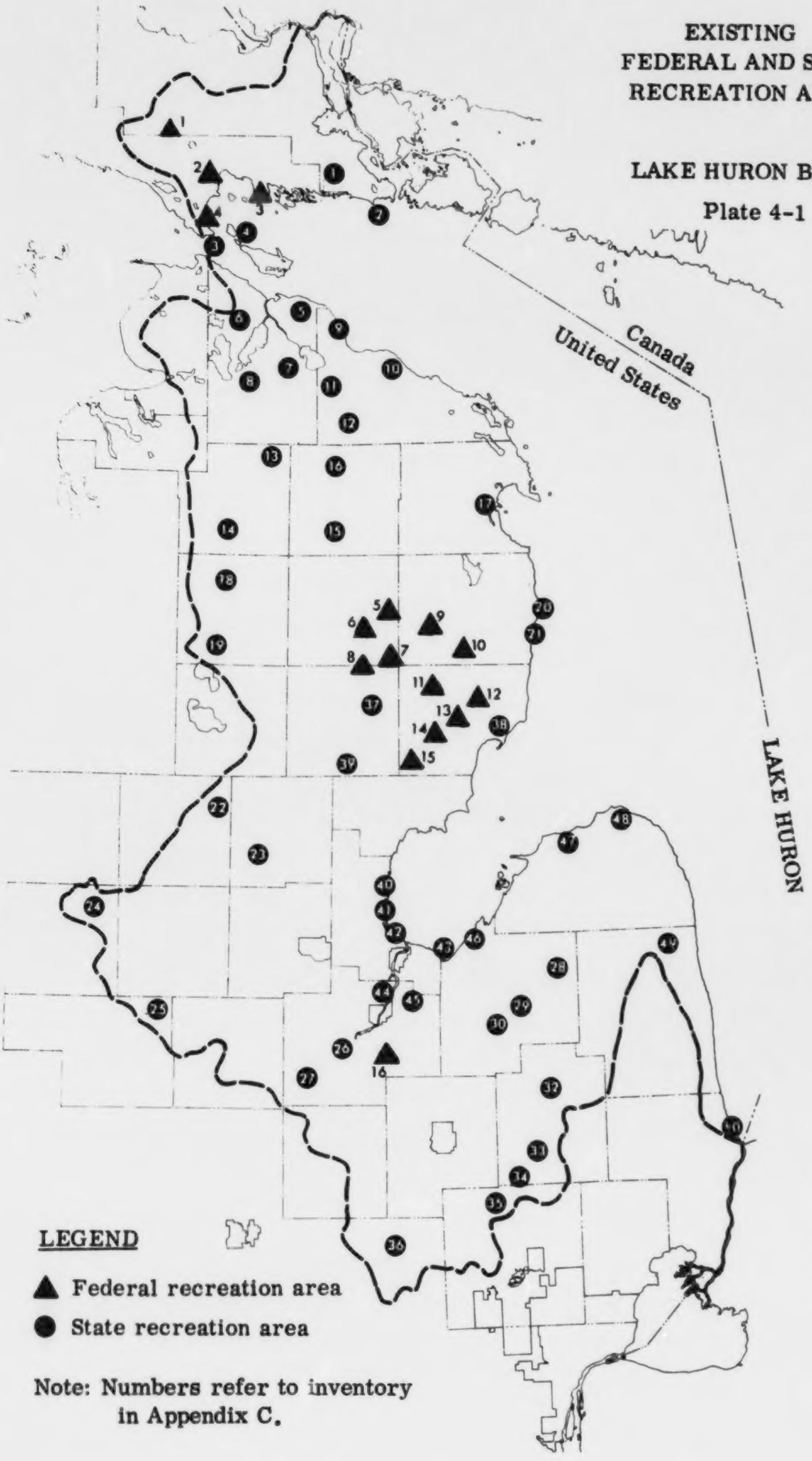
Private. Private developments are a major source of outdoor recreation opportunity in the Lake Huron Basin. Commercial establishments, plus property purchased for individual or family use, help to fulfill the demands of many resident and nonresident recreators. Reliable inventory data are not available for a complete analysis of the private sector; therefore, the study is limited to a more general approach.

There are approximately 44,000 private seasonal homes in the basin (21). Most vacation homes are concentrated in areas adjacent to or near water. Although some seasonal residences are a source of recreational opportunity within themselves, most rely on resources beyond recognized property lines. Both public

EXISTING FEDERAL AND STATE RECREATION AREAS

LAKE HURON BASIN

Plate 4-1



LEGEND

▲ Federal recreation area

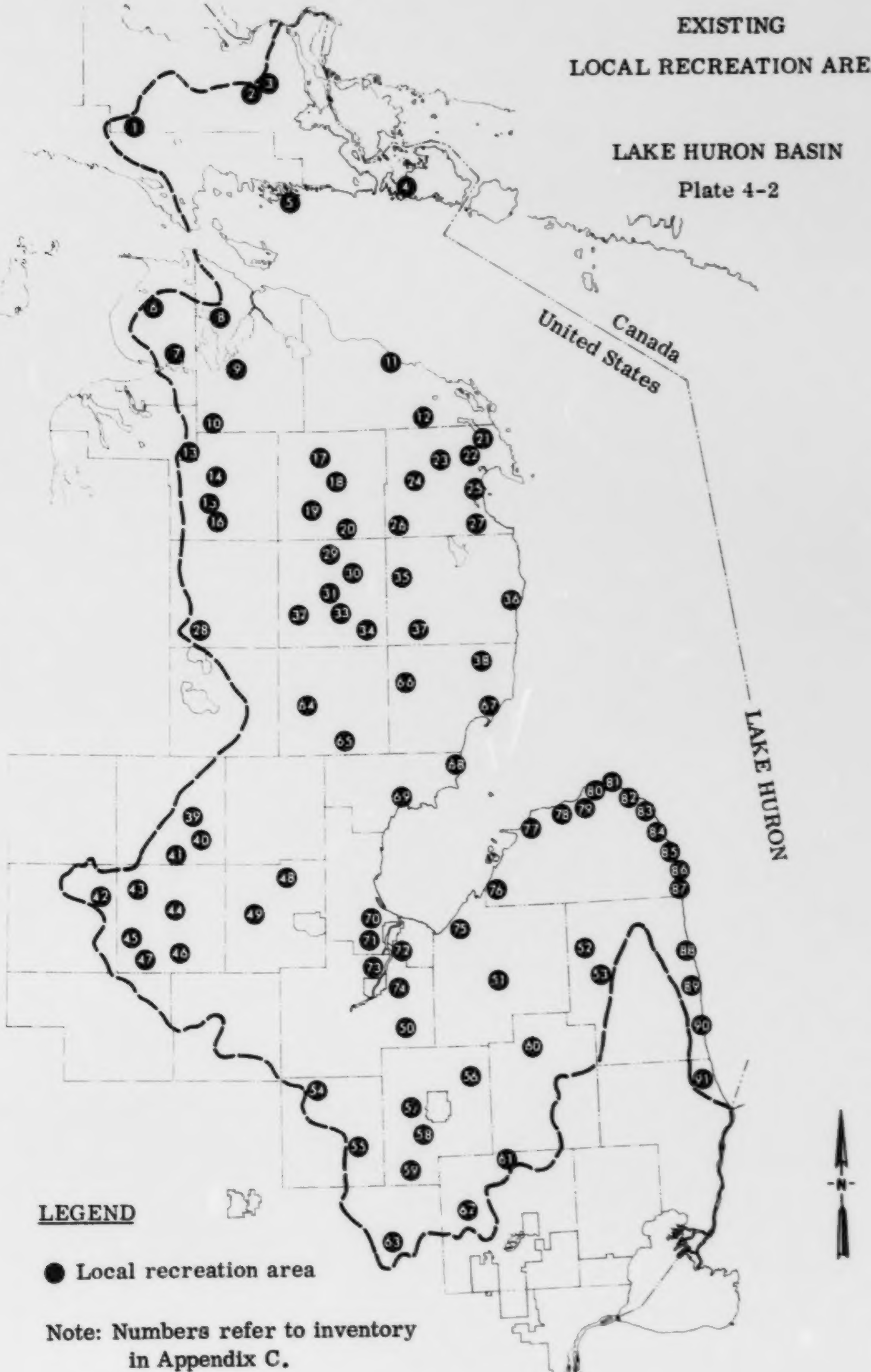
● State recreation area

Note: Numbers refer to inventory in Appendix C.

EXISTING
LOCAL RECREATION AREAS

LAKE HURON BASIN

Plate 4-2



LEGEND

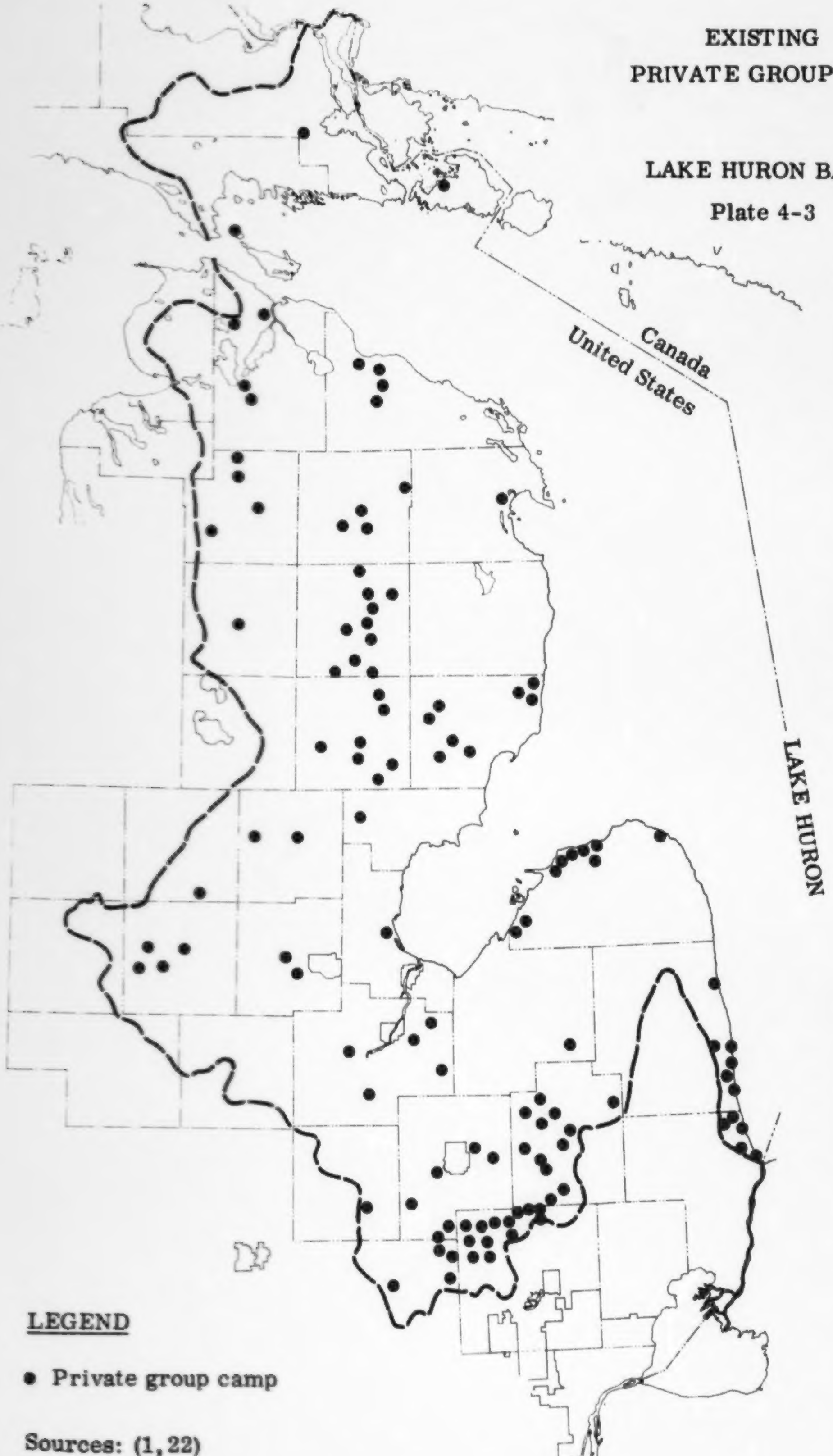
● Local recreation area

Note: Numbers refer to inventory
in Appendix C.

EXISTING PRIVATE GROUP CAMPS

LAKE HURON BASIN

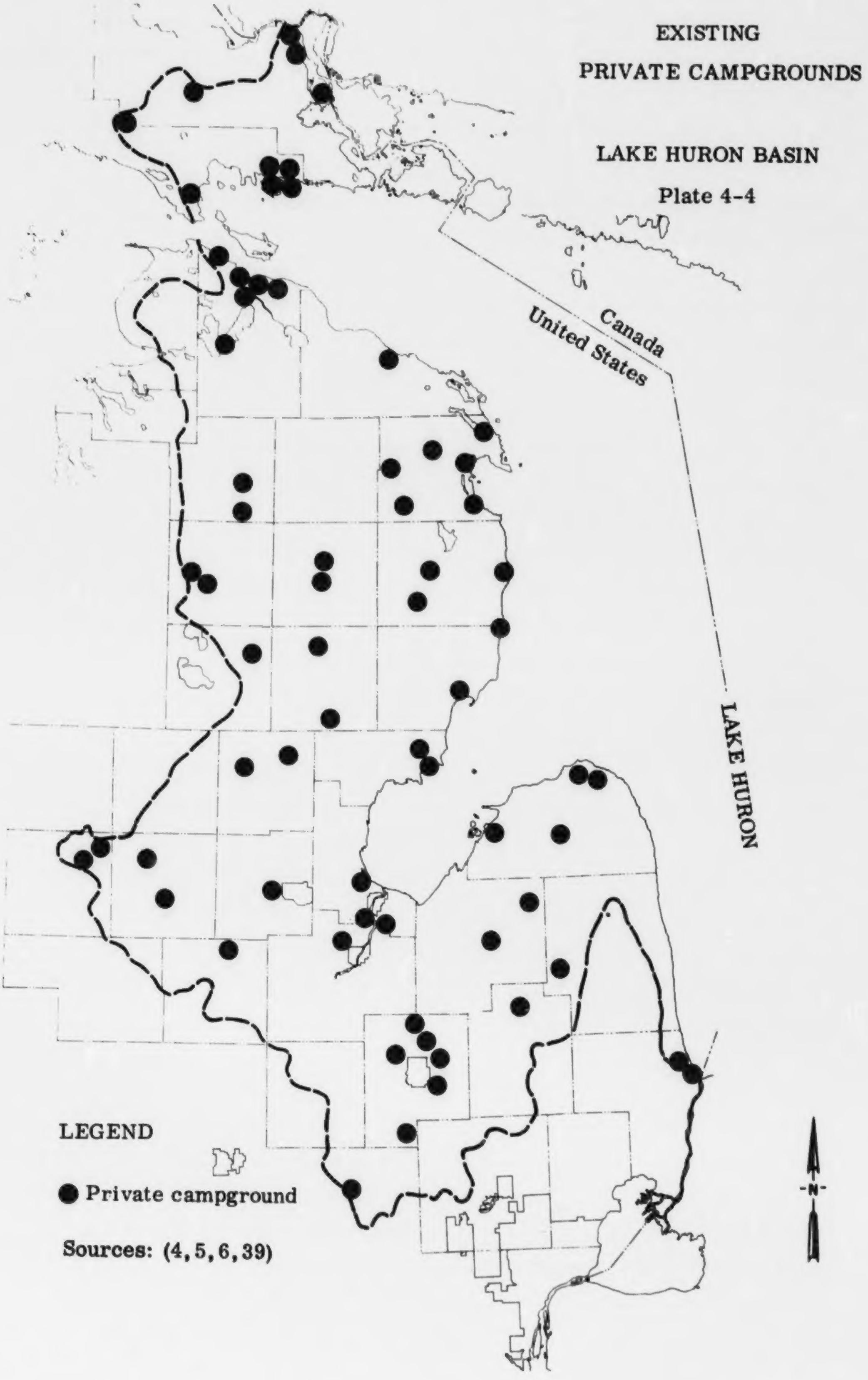
Plate 4-3



LEGEND

● Private group camp

Sources: (1, 22)



EXISTING
PRIVATE CAMPGROUNDS

LAKE HURON BASIN

Plate 4-4

LEGEND

● Private campground

Sources: (4,5,6,39)

and commercial installations serve the desires of seasonal home owners with the public agencies providing the more basic resources and the commercial establishments serving those desiring specialized facilities. Commercial recreation enterprises can often supplement publicly-operated areas. Supplementation is in two forms: providing opportunities not feasible for public agencies, and providing overflow accommodations when public facilities are filled to capacity.

Group and Organization Camps. There are approximately 120 group and organization camps within the basin (22). Church, ethnic, fraternal, and service organizations usually operate and maintain these camps. In certain instances government agencies lease public land to these organizations with the understanding that any change in the landscape must correspond with the leasing agency's prescribed standards. Organization camps frequently provide the recreational and educational opportunities to that segment of the population unable to utilize public or commercial facilities. Transportation, lodging, food, and guidance are often provided at minimal cost. With a daily capacity of 13,189 visitors, the group and organization camps are a significant and valuable contribution to the basin's recreational assets. Plate 4-3 indicates location of private group camps. Table 2 in Appendix A summarizes the number and size of group camps by zone.

Private Campgrounds. Private campgrounds provide 2,304 campsites at 69 individual areas. (See Table A-3.) Being frequently located near public recreation facilities, private campgrounds perform a dual function; they accommodate a class of clientele preferring the atmosphere of a private installation and also absorb overflow from public areas during peak recreation seasons. The degree of development ranges from a complete complement of sanitary, recreation, and service facilities to little more than a field free of high brush. Plate 4-4 indicates the location of private campgrounds.

Winter Sports. The large investment needed to develop and maintain a winter sports area -- especially one offering ski lifts, an ice skating rink, restaurant, lounge, and lodging -- requires that an area not lay dormant during the warmer seasons. For this reason, many of the winter sports areas assume a resort atmosphere from June through September. Golf courses, riding stables, fishing and boating ponds, youth programs, and chairlift replace skiing, tobagganing, and ice skating rides as the primary attractions. The 22 private winter sports resorts represent the only developed skiing facilities in the Lake Huron Basin (21,27).

Boat Rental and Marina Facilities. Resorts and other privately operated tourist accommodations offer boat rentals for the convenience of guests and as a means of supplementing their income. The canoe liveries on the Au Sable River are an exception to this generalization in that they are a principal source of income for their owners. On summer weekends literally thousands of canoes ply basin streams; many of these canoes are rented from private boat liveries.

Marinas and harbors of refuge on Lake Huron are largely publicly owned and operated. However, in some areas privately owned facilities are available to service recreational equipment and to satisfy the various needs of the people using marina facilities. Privately owned marinas are more prevalent on inland waters where public facilities are lacking.

Recreation Facilities by Zone.

Zone 1. Excellent natural features and limited urban developments have encouraged the use of Zone 1 for public acquisition and development of recreational lands. Approximately 1,756,368 acres are in public ownership, of which 3,943 acres are intensively developed for recreational purposes. Thirteen of the basin's 19 state parks are located in Zone 1, and all offer opportunities for water-dependent activities. The 1,722,000 acres of state and federal forest land serve a multitude of recreators interested in activities which require a remote atmosphere. Michigan's Lake Huron Shore to Lake Michigan Shore Riding and Hiking Trail makes substantial use of these relatively undeveloped lands. Campgrounds, interpretive trails, hunting and fishing opportunities, swimming beaches, and picnic grounds are also provided.

Lakes, rivers, and streams are well distributed throughout Zone 1. Access to these waters is provided by 46 water access sites and 105 water-oriented public and quasi-public recreation areas. A multitude of beaches, boat liveries, and campgrounds are also operated by private interests.

Mackinac Island, Straits of Mackinac, St. Ignace, Sault Ste. Marie, and several other locations are representative of the established historic sites in the basin. Many time additional recreational facilities have been developed in conjunction with the area of historic interest. A noteworthy example is Mackinac Island which is well known for its bicycle trails, boat harbors, and a varied assortment of other recreational facilities.

The same features which have encouraged public investment in Zone 1 have also attracted private interests. Approximately 20,000 seasonal homes are concentrated in this zone. The primary attractions are the forested landscape, Lake Huron's shoreline, and the 147,000 acres of inland water. The same features have encouraged resort development and a service industry to accommodate the nonresident recreator. Private investors have also taken advantage of the topography which lends itself well to winter sports activities. Thirteen of the basin's 22 ski facilities are located in Zone 1.

Zone 2. A marked characteristic of Zone 2 is its lack of Lake Huron shoreline. This, in combination with zonal land-use patterns, significantly reduces its recreational potential. Unlike Zone 1, the primary impetus for purchasing and developing land for recreation has not been an attractive resource base, but rather the demands generated by a large population concentration. (In addition to serving the basin's major cities, Zone 2 is also the first area encountered by visitors from southeastern Michigan.) With the exception of the northern one-third, this zone supports primarily day and weekend-use recreation areas.

Publicly-owned lands comprise 130,774 acres; 3,129 acres of this total are intensively developed. Zone 2 contains four state recreation areas and only one state park. Emphasis has been placed on the acquisition of land for game management and hunting opportunity. The federal government through the Bureau of Sport Fisheries and Wildlife manages 8,857 acres of refuge land; and the state of Michigan has 53,000 acres divided into nine state game areas. These lands also support other activities such as fishing, hiking, nature study, and sightseeing. As in Zone 1, state forests account for the largest share of government controlled lands.

Zone 2 is one of the state's most attractive areas for private development because of easy accessibility from southeastern Michigan. Fouteen thousand seasonal homes are located in the zone, concentrated primarily in the extreme southern and northern sectors where inland lakes are more numerous.

The number of group camps in Zone 2 nearly equals the combined total in Zones 1 and 3. This is largely attributable to the previously mentioned factor of accessibility. These camps have a daily capacity of 6,400 persons. In a 90-day summer recreation season, over 1,440,000 activity occasions are capable of being satisfied by group camp facilities in Zone 2.

Another facility in which Zone 2 leads is the development of private shooting preserves. Over 4,000 acres are devoted to controlled game management and sportsmen harvest. Some preserves are open to the public while others are operated as private hunting clubs. To many hunters, the opportunity of having a quality hunting experience close to home justifies the additional expense incurred for the use of this type of facility.

Winter sports facilities are well dispersed throughout the zone. There are eight ski areas; two of these also have toboggan runs. Most ice skating rinks, sled hills, and additional toboggan runs are located in or near the densely populated areas. Utility line right-of-ways, fire lanes, and service roads in the state forests offer opportunities for snowmobiling. Other winter activities frequently associated with these forests include snowshoeing, cross country skiing, and hunting. Ice fishing is popular in the lake areas of the extreme southern and northern portions of the zone.

Zone 3. The Lake Huron shoreline is the most important recreational resource of Zone 3. Most of the rivers are too small for large-scale development, with the exception of the Rifle and Saginaw Rivers which are focal points of recreation development. The five state parks in this zone are located on Lake Huron. In addition, there are 14 local parks and 42 recreational harbors fronting on or contiguous to Lake Huron. The renowned waterfowl habitat associated with the Saginaw Bay area is preserved in part by the 12,300 acres designated as state game and wildlife areas*. Saginaw Bay and the access provided by the aforementioned facilities are popular with fishermen the year around.

This zone is particularly well suited for waterfowl hunting, fishing, boating, and bathing. Water-enhanced activities, although evident, suffer from a lack of significant recreational acreages. Much of the Lake Huron shoreline is heavily developed, thereby restricting public access and development. The interior portion of Zone 3 is predominantly agricultural lands and not suited to extensive recreational development.

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* 5,421 acres are located adjacent to Lake Huron.

Plate 4-5

Mile upon mile of lakeshore frontage is consumed by private residences, substantially limiting utilization by the general public. Photo by Bureau of Outdoor Recreation.

North of Bay City the soils are less suited to agricultural production. Forest vegetation predominates providing opportunities for recreational development away from the lake shore. The Rifle River is a focal point for both public and private development. In this river basin there are four public fishing sites, two county parks, a 4,329-acre state recreation area, and 182,900 acres of state forest land. A combined visitation of 814,000 was reported for these eight units with 95 percent of the use concentrated on the Ogemaw State Forest.

Seasonal homes dominate the private development. Comparing Zone 3 with Zones 1 and 2 shows the extent and concentration of private recreation residences. (See Table 4-1.) This development is concentrated in a narrow band along the Lake Huron shoreline representing the most heavily used recreational resource area in the basin.

Table 4-1

NUMBER OF SEASONAL HOMES BY ZONE
Lake Huron Basin

Zone	Seasonal homes
Zone 1	19,840
Zone 2	13,875
Zone 3	10,560

Source: (21)

RECREATION ACTIVITIES

The majority of recreation activities are water-oriented, including those directly dependent on water, and those significantly enhanced by the presence of water. Swimming, boating, and fishing are classed as water-dependent activities, while hiking, camping, sightseeing, picnicking, and driving for pleasure are examples of water-enhanced activities. The following discussion is concerned with the basin's ability to satisfy demands for various recreational opportunities with special emphasis on water-oriented activities.

Water Dependent Activities.

Swimming. Of the recreation activities classed as water-dependent, swimming is the most popular. Diving and skin diving attract additional participants and create diverse demands on the basin's water resources. A swimmer usually desires more than the basic resource of water. Sandy beaches, pleasant scenery, lifeguards, litter-free facilities, and other amenities associated with a quality swimming area are also expected. Lake Huron, with its 159 miles of beach and appealing scenery provides many opportunities for swimming. There are also a number of formidable deterrents: short seasons, cool temperatures, limited access, and biological pests such as flies and mosquitoes.

Another valuable source of recreational water is the 208,000 acres of inland lakes. These lakes have certain inherent characteristics which contribute to their desiribility such as warmer water and less wave action. Swimming in the basin's rivers is negligible because of poor water quality and deceptive currents. Impoundments have been constructed thus creating a more satisfactory water environment for water-contact activities.

Seventy-eight percent of the 257 public recreation areas in the Lake Huron Basin provide swimming facilities. Visitation estimates for 168 of the 257 areas are summarized in Table 4-2.

Table 4-2

COMPARISON OF VISITATION STATISTICS
LAKE HURON BASIN 1963

	Number of Areas Reporting	Estimated Visitation (millions)
With swimming facilities	68	10.5
Without swimming facilities	100	2.5
Total	168	13.0

Source: Appendix C

Excellent quality beaches are located in the vicinity of Tawas City. Photo courtesy of Mich. Tourist Council.

Plate 4-6

Boating. There are approximately 70,000 boats registered to residents of the Lake Huron Basin (21). However, the actual number of watercraft using basin waters is difficult to determine. Basin residents have access to waters outside the basin, while large numbers of nonresident enthusiasts satisfy their boating desires on Lake Huron and its tributary system. The Michigan Outdoor Recreation Plan estimates that boat ownership will increase to 77,500 units by 1980. This addition of units, combined with increased use of existing craft, will exert 30 percent and 20 percent greater pressures on Lake Huron and inland lakes, respectively (21). Because of the variety of boats and boating activities, each facet will be discussed separately.

Power Boats. The internal combustion engine has been applied in a number of ways to today's watercraft; outboard, inboard, stern drive, and water jets are some of the more common forms of motorized propulsion. The availability of these various power sources has encouraged the use and added to the flexibility of today's watercraft. The versatility of powered boats has greatly increased the number of activities available to the boating enthusiast. People not necessarily interested in boating per se are using powered watercraft as a means to an end of their own preference, of which water skiing, hunting, and fishing are examples.

The adaptation of internal combustion engines to recreational watercraft has created complex recreation management problems. Powered boats have been a major factor leading to the zoning of water surface acreage. The speed, noise, and injury-inducing capacity of engine-driven craft usually render them incompatible with many other recreation activities. Fishermen sometimes resent the noise and wake of power boats; few swimmers have ever won a duel with a boat bow or motor propeller. Things that might form a good habitat for wildlife -- trees, stumps, aquatic plants -- would be dangerous to water skiers. Complicating this problem is the vast amount of surface area required for the operation of motorized boats and their related activities. While one acre of suitable water will accommodate 350 swimmers, a boat pulling a water skier requires approximately 24 acres of useable water for safe operation. The problems are apparent, and some effort has been put forth to solve them.

Zoning has been applied in two forms -- time and area. Time zoning designates specific hours, days, or seasons, etc., in which certain activities are allowed and others prohibited. An example of this would be the reserving of early morning and late evening hours for fishing and allowing the more active recreational pursuits access during the intervening time. Area zoning is implemented by prohibiting certain activities on a body of water or a portion thereof. Horsepower limitations, controlled traffic patterns, speed limits, and other approaches are commonly applied to areas or activities experiencing overuse and conflicting interests. The development of new facilities and the acquisition of land and water can postpone these restrictive actions, but not indefinitely. Constructing new reservoirs and access points often increases participation rather than alleviating pressure on existing waters. Although this problem is common to recreation in general, it has proven a particularly acute one for boating.

Canoeing. The Lake Huron Basin contains one of Michigan's most popular canoe trails, the Au Sable River. Boat liveries on the Au Sable have 1,500 canoes available for rental (21). On ideal canoeing weekends it is estimated that privately owned canoes on the Au Sable nearly equal the number of rental craft. Presently there are 814 miles of waterways designated as canoe trails (Plate 4-19)(21). Enticing the water voyager to other streams in the basin will require time, legislation, development, and promotion. Some rivers in the basin, or significant portions thereof, offer no more than bare, eroded banks and poorly developed flood plains. The esthetic experience desired by canoeists can be maintained by a wilderness shoreline environment. This partially accounts for the Au Sable's popularity and the meager use being made of many other waterways in the basin.

Sailing. Certain inate characteristics associated with sailing tend to discourage many people from becoming active enthusiasts. The more important limiting factors are initial expenses, time and money for craft maintenance, and the high degree of skill required to operate a sailing vessel. Some efforts are being made to reduce initial and maintenance costs. However, these prohibitive aspects remain in sufficient degree to hinder active participation by many potential yachtsmen.

What sailing lacks in participating numbers, it gains in shoreside spectators. Thousands throng the shoreline during the annual Port Huron to Mackinac Island Yacht Race. If income and leisure time projections prove accurate, many shoreline spectators may be freed from their landward posts and able to participate actively in this sport. The possibility of Lake Huron's becoming crowded with sailboats is

Michigan's proposed wild rivers program could play an important role in preserving the basin's scenic and challenging canoe streams.

Sailing is very popular on the protected bays of Lake Huron and the large inland lakes throughout the northern portion of the basin.

Photos courtesy of Mich. Tourist Council.

Plate 4-7

Plate 4-8

Plate 4-9

Although the seasons and techniques vary, the objective is the same—catching fish. Photos by Michigan Department of Natural Resources.

inconceivable, but harbor and docking facilities are already showing signs of congestion during peak recreation periods.

Fishing. Unlike many activities, fishing is not confined to a particular season. The Lake Huron Basin provides recreation for the fisherman on a year-around basis. The species sought and the technique used change from season to season, but the basic desire -- catching fish -- remains. Spring brings out the smelt, sucker, and trout fishermen with their nets, spears, and fly rods. Bass, walleye, northern pike, muskellunge, and various panfish satisfy the angler during summer and fall months. When winter arrives, the conventional casting equipment and cane pole are replaced by the tip up and spear; nearly all species are open game.

Plate 4-10

Perch fishing from the breakwater is a popular pastime of residents and non-residents alike. Photo by the Michigan Tourist Council.

Water access is provided both by governmental and private interests. There are 77 water access sites which the state of Michigan has developed in the basin. (See Plate 4-11.) These are complemented by additional public sources of access in state and county parks and national forests. Public marinas provide facilities which satisfy a significant portion of the demand for access to fishing waters. Approximately 50 percent of the state's boaters use the Great Lakes and predominantly the public marina facilities (21). Projected state plans call for the location of boating facilities every fifteen miles along the shoreline of heavily used waters (21). Structures designed to shelter watercraft satisfy a significant portion of the demand generated by fishermen. On mild summer days the number of people fishing from breakwaters may equal or exceed the number of boaters using harbor facilities.

Water-Enhanced Activities.

Picnicking. Generally picnicking is the act of eating outdoors and differs from the backyard barbeque in that it takes place in a natural setting. Occasionally an individual's or family's single purpose for an outing is to picnic, but most often picnicking is integrated into a day of outdoor recreation activities. Tables, trash

WATER ACCESS SITES
AND
HARBORS OF REFUGE

Plate 4-11

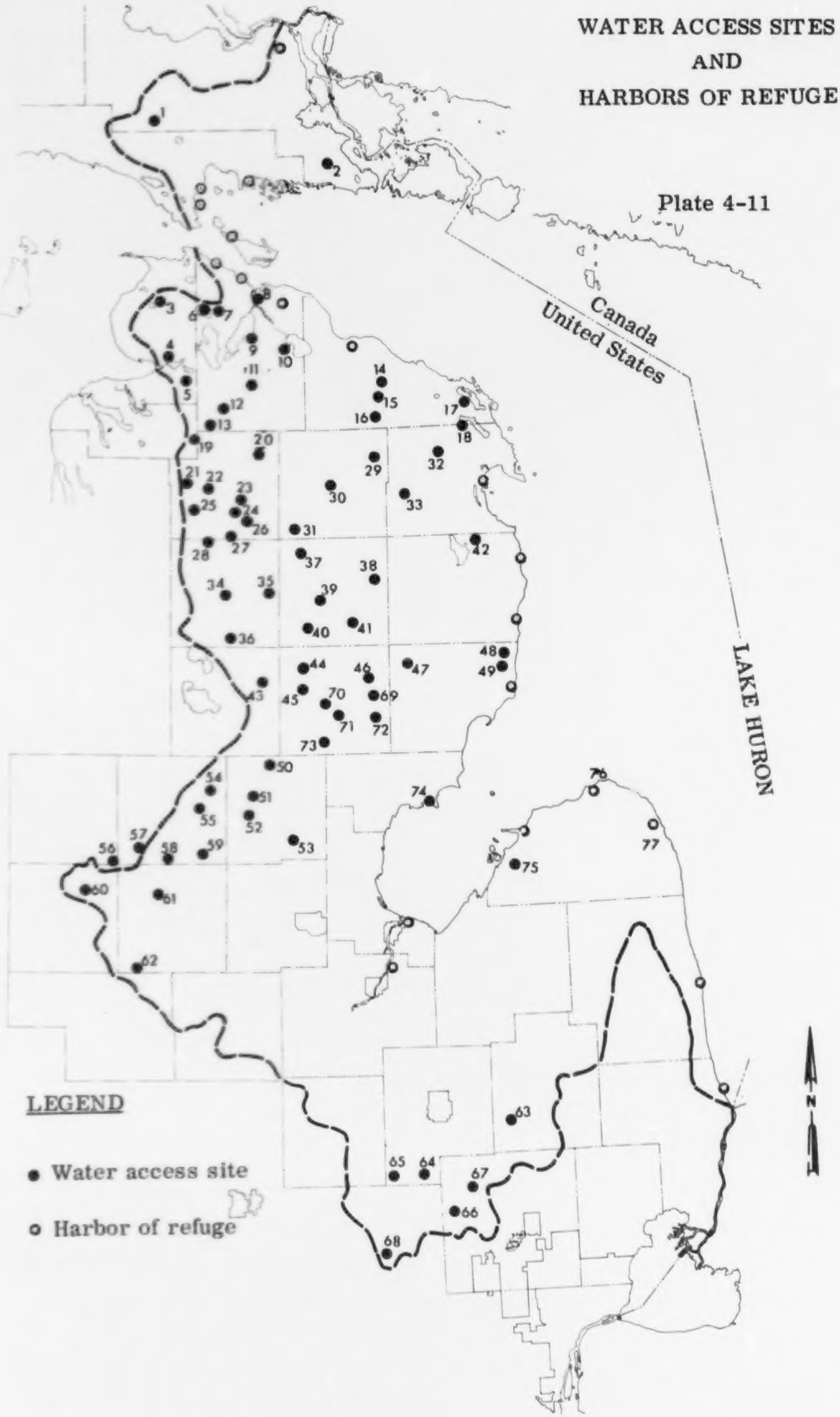


Plate 4-12

Will these children dispose of their paper wastes in the proper manner? The availability of waste receptacles is not the entire solution —proper attitudes of people are the primary requisite to clean and enjoyable picnic areas. Photo by the Michigan Department of Natural Resources.

barrels, and outdoor cooking facilities are provided in most areas frequented by recreationists. Highway right-of-ways, state parks, wildlife refuges, national forests, and water access sites all possess the natural ingredients needed for a picnic area -- a small plot of land and perhaps a tree for shade. A waterside site is most popular among picnickers. Of the 257 recreation areas in the basin, 124 provide picnicking facilities (Appendix C).

An environmental problem plaguing some areas in the basin which provide picnicking opportunities is vegetation depletion. Along the lakeshore and in northern portions of the basin, soils are thin and poorly structured. After repeated tramplings by thousands of visitors, vegetation is worn off and soils are compacted. Water ceases to penetrate the soil, and erosion is initiated by surface runoff. The severity of this problem varies in relation to the local relief, soils, vegetation present, and also the recreation pressures placed on the area.

Plate 4-13 *Photo by BOR.*

Another problem associated with areas providing picnicking facilities is public apathy regarding grounds maintenance. The littering and damaging of public property are major management concerns. Some damage is inevitable, but the degree could be greatly reduced if personal attitudes toward public property were improved.

Camping. Efforts on the part of public agencies to keep abreast of the demand for camping facilities have not been successful. The demand for camping facilities often exceeds the supply. In the basin there are 107 public areas where camping facilities are available. Coping with the influx of campers has severely taxed the resources of many federal, state, and local agencies. (Appendix C.)

Camping and picnicking facilities suffer from sporadic visitation. During weekdays the recreation areas receive only light use, but on weekends people must be turned away.

Plate 4-14 *Photo by Michigan Dept. of Natural Resources.*

A cleared plot of ground and a pit latrine were once considered "average" campsites. The ultimate in equipment a decade ago consisted of a good tent with its own flooring. The home-away-from-home philosophy has since filtered into the camping field. Today, any campground not providing running water, sanitary systems, and electricity is considered primitive. Camping trailers in various forms are dominating the public campgrounds. Convenient electrical, water, and sanitation equipment has been installed to accommodate the demands of this new generation of "outdoorsmen". Providing and maintaining this type of facility is expensive, and it comprises a major portion of development and operations cost.

Sightseeing. The subtlety of this activity is not reflective of its importance. Every aspect of recreation is enhanced or degraded by those facets of the environment with which the participant has visual contact. Visual satisfaction in combination with olfactory and auditory sensations is the factor that separates outdoor recreation from other forms of recreation. The enjoyment derived from swimming, picnicking, camping, hunting, fishing, and other activities is, in part, dependent on the surrounding natural environment.

When sightseeing is the stated purpose for a recreation day, historic sites and

Plate 4-15

Mackinac Island is noted for its bicycle trails and absence of motorized traffic. Photo by the Michigan Tourist Council.

Sightseers have always been attracted by waterfalls. The only two waterfalls in the lower peninsula of Michigan are both located in Lake Huron Basin. Photo by Michigan Department of Natural Resources.

Plate 4-16

natural features of unusual quality are the primary destinations. The waters, forests, and wildlife of the Lake Huron Basin are its major scenic assets and provide a pleasant setting for many recreation activities. Mackinac Island, mainly because of its history and culture, is the most popular scenic attraction in the basin. The Mackinac Bridge has made it possible for large numbers of people to visit this area. Other sites of historical and/or cultural importance may be developed to attract tourists, but natural phenomena comparable to Lake Superior's Pictured Rocks and Porcupine Mountains are not available in the Lake Huron Basin.

Nature Interpretation. Accompanying the popular growth in outdoor recreation is an accelerated interest in nature. Federal, state, and local agencies have developed interpretive programs at several of their recreation areas. With the added understanding gained through these programs, people are more able to enjoy the outdoors. Knowledge of nature is often incorporated into other activities, an example being the hiker who adds to his day's experience by attempting to identify available flora and fauna. For some individuals nature study has developed into a separate activity. Areas of concentration include identification, function, and ecological interrelationships. Students of nature, ornithologists for example, differ from sightseers in that their interest goes deeper than visual pleasure. The object of study may be recognized as a thing of beauty, but its functional characteristics are also appreciated. A subject of special interest in the Lake Huron Basin is the Kirtlands Warbler. This species spends most of the year on a Bahamian Island but returns to a special section of the Huron National Forest for nesting and rearing of its young. Intensive efforts are being made to maintain a desirable habitat in which the Kirtlands Warbler can survive and propagate. The Lake Huron Basin contains a wide variety of plants and animals arranged in several ecosystems. Bogs, swamps, sand dunes, lakes, and a multitude of forest types comprise some of the major ecological communities.

Plate 4-17

The Kirtlands Warbler is not a distinctive looking bird but is rare in number and range. Photo by Michigan Department of Natural Resources.

Plate 4-18

People are anxious to learn more about the environment in which they recreate. Photo by Michigan Dept. of Natural Resources.

Trailing. Planned trail development is a relatively new concept in the Lake Huron Basin. In the past abandoned or seldom used roads and right-of-ways served as recreation trails. Actual trail construction was done on a small scale. Even at present, old roads and right-of-ways supplement a significant portion of the basin's trail system. Table 8 in Appendix A indicates that there are 386 miles of riding and hiking trails in the basin. Interested public agencies and private groups are attempting to plan and to provide trails that will adequately meet today's demands. Included are trail-side camping areas, outdoor cooking equipment, water access sites, comfort stations, stables, and interpretive signs.

As with other recreation activities, trailing suffers from the conflicting interests of its staunchest advocates. Two sources of discontent are excessive participation and mode of trail transportation, with the latter receiving the greatest attention. Hiking, horseback riding, and motoring are the three major forms of trail travel. The only major completed trail in the basin is restricted to hikers and horseback riders; motor vehicles are prohibited (28). (See Plate 4-21.) This only partially alleviates the conflict as hikers sometimes dislike the experiences associated with following or meeting horses on the trails.

Photo by BOR.

Photo by Michigan Dept.
of Natural Resources.

Plate 4-19

Separate trails are needed for each of these three activities if conflicts are to be avoided.

Photo by Michigan Dept. of Natural Resources.

Hiking. Those who walk the trails for days on end, carrying only the basic materials necessary for survival, have much in common with the family on an afternoon walk following a state park trail. Both wish to witness and to absorb a part of nature. Differences do exist, vis., the serious hiker often desires to re-awaken a sense of physical prowess and self-reliancy, while the casual trail visitor may simply seek relief from the anxiety of his vocational or domestic life. Both groups have received consideration in the Lake Huron Basin. The Michigan Shore to Shore Riding and Hiking Trail is capable of sustaining an extensive hiking trip. State and local parks provide trails for the less adventurous or restricted hiker.

Horseback Riding. Provision of horses, riding tack, stables, and feed is and has been the responsibility of private enterprise. Public agencies assist in the development of trails but this, too, is often done by interested private groups or individuals. The Shore to Shore Riding and Hiking Trail is at present the basin's only example of an extensive trail which can accommodate trail riders. Adjacent to the basin's portion of this trail are 3 rental stables, 2 farriers, 6 veterinarians, 3 boarding stables, and 10 campgrounds available to equestrians (28). Some parks provide limited facilities for riding enthusiasts, but the state and national forests are most ideally suited to meeting their demands. Large acreages of wooded lands interspersed with old logging and pipeline roads abound in the basin. Utility right-of-ways are also being made available to horseback riders and other trail users. The land is available and accessible; however, developed facilities are lacking.

Cross Country Motoring. The vehicles which fall within this category are four-wheel drive automobiles and trucks, trail bikes, and machines with treads. Discussion concerning the latter is reserved for the winter sports section. Hikers and horseback riders generally object to using trails which allow motorized vehicles. The noise and injury-inducing capacity considered inherent with these machines are the major criticisms. Soil erosion, fires, and vegetation destruction are problems frequently attributed to trail vehicles by public management agencies. Interested groups of trail users have been successful in their efforts to exclude trail bikes and four-wheel drive vehicles from public trails. As of 1966 there was not one mile of trail on state or federal lands in the basin specifically designated for exclusive use by cross-country vehicles (21, 56). However, there is substantial mileage of old logging roads in the National Forests for this use.

Also missing is the quantity of restrictions necessarily enforced on other state facilities. Private clubs and organizations of motor sport enthusiasts have purchased small tracts of land on which they can engage in competitive contests or ride in an unrestricted manner. While fulfilling a need, these small private holdings cannot satisfy the demands of those who enjoy cross country trailing. This requires the extensive acreages and professional management available through public agencies. As is indicated by the following quote from the Michigan Outdoor Recreation Plan, this problem is recognized and appropriate solutions are proposed.

> "When, in lieu of new roadways, those already in use for another transportation purpose are encroached upon, conflict ensues as, for example, in the instance of snowmobiles versus automobiles; pleasure boats versus commercial boating (as in Great Lakes waterways and harbors); bush vehicles and Hondas versus regional park hiking trails. Each of these vehicles is a legitimate recreation tool, yet each requires special accommodation or inter-activity adjustment, as for instance the construction of specialized brush vehicle and snowmobile trails, or the adoption of boating regulations."

Hunting. The basin has approximately 90,000 acres specifically devoted to the management, propagation, and hunting of wildlife, 90 percent of which is administered by the state of Michigan. Funds for acquisition and management of state lands are derived from license fees and a tax on hunting equipment. With the exception of state parks, state-owned lands are usually open to hunting. Many game species are sought by basin hunters. Lake Huron shares with Lake Erie the distinction of providing some of the midwest's finest waterfowl hunting. The Saginaw Bay is both a nesting and a migratory stop-over area for a variety of puddle and diving ducks, geese, and swans. Thunder Bay, Tawas Bay, and

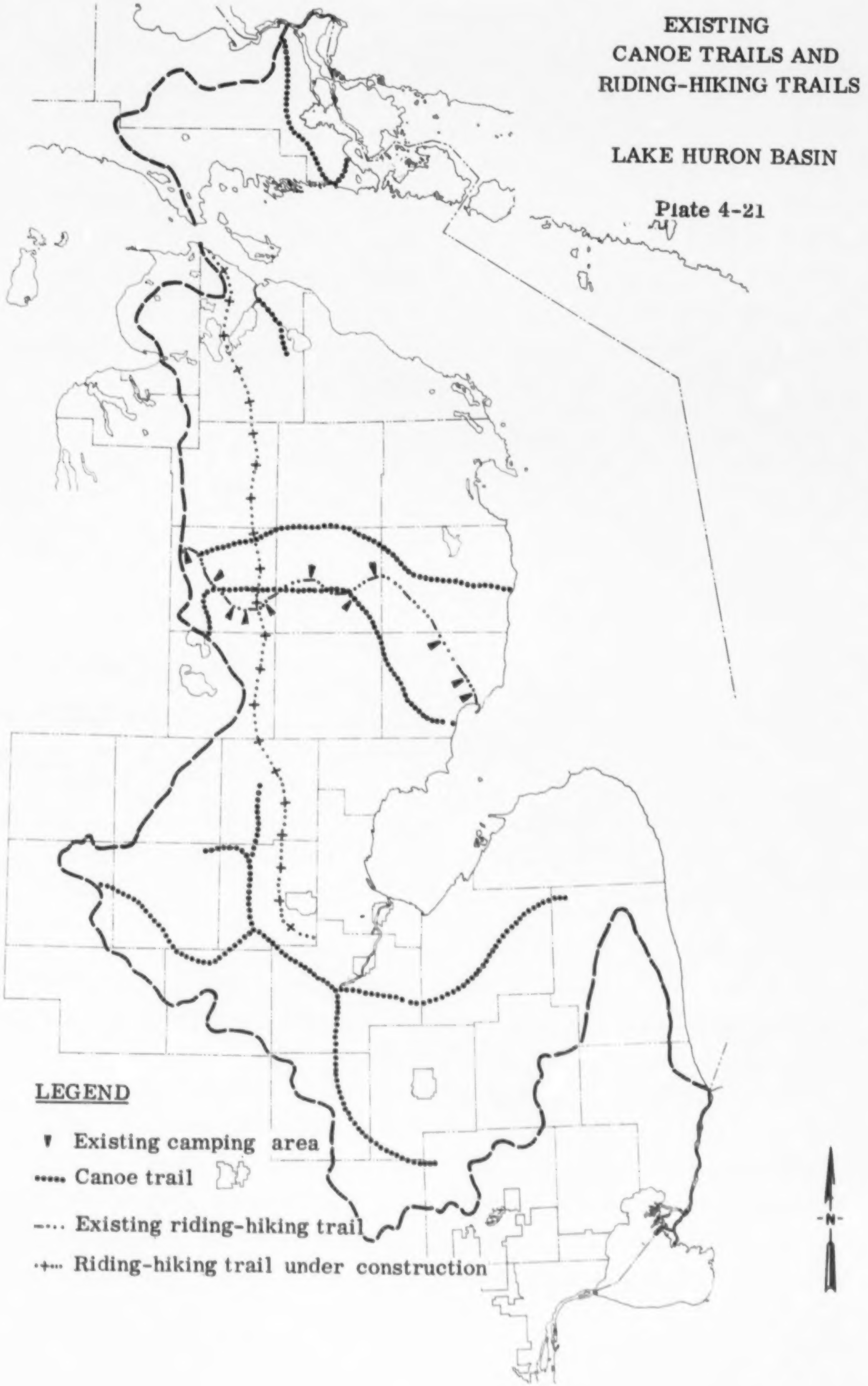
Several million acres of undeveloped land provide excellent hunting opportunities in the basin. Photo by Michigan Department of Natural Resources.

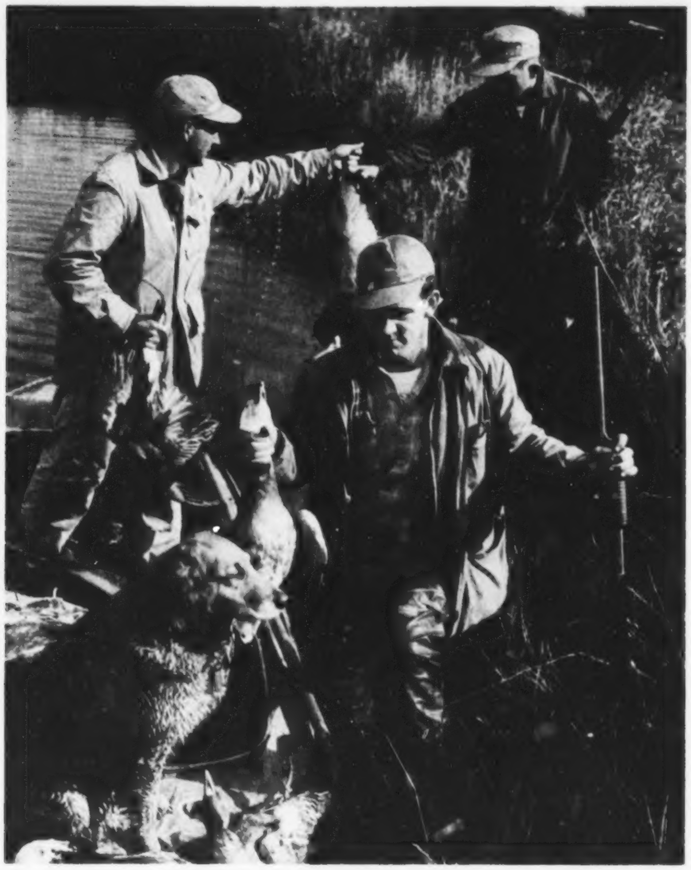
Plate 4-20

EXISTING
CANOE TRAILS AND
RIDING-HIKING TRAILS

LAKE HURON BASIN

Plate 4-21


LEGEND
▾ Existing camping area
•••• Canoe trail
–··· Existing riding-hiking trail
·+·· Riding-hiking trail under construction
N



A variety of native and migratory waterfowl are found in the basin's marshes and coves. Photo is by Michigan Department of Natural Resources. Plate 4-22

several small coves also support significant numbers of waterfowl (32). Through the acquisition of marsh land and water access sites, the state is attempting to secure sufficient habitat and facilities to accommodate both the ducks and the hunters. The national forest lands are a very significant hunting area in the basin. Maintenance and improvement of hunting habitat is given full consideration in resource management decisions and practices. Private lands have long been a mainstay for much of the basin's hunting opportunity. However, much of this land is no longer available for hunting purposes. Urban sprawl has consumed former hunting lands on the periphery of many communities, and the formation of numerous hunt clubs has further reduced the amount of lands available to the public.

Even more significant in the Lake Huron Basin is the degeneration of the relationship between land owners and visiting hunters, evidenced by the increased posting of private lands. The state, interested sportsmen, and a small number of private entrepreneurs have taken measures to reduce the gap between supply and demand. Formal and informal groups of hunters are attempting to improve the relationship between land owners and sportsmen. They have also leased or purchased land to insure themselves of a quality hunting experience. Until recently it was illegal to operate a commercial shooting preserve in Michigan; however, legislation was passed in 1957 permitting the operation of put-and-take hunting. Today there are 18 private shooting preserves in the basin, comprising 5,400 acres (21).

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Winter Sports. The Lake Huron Basin supports winter recreation activities common to the northern temperate climate zone. Skiing, snowmobiling, ice skating, ice fishing, sledding, tobogganing, and hunting are some of the more popular winter activities in the basin. Except for skiing, public agencies have generally assumed the responsibility for development of winter recreation facilities. Private businessmen own and operate the basin's important ski industry.

With a major portion of the basin's economy dependent on tourism, it was imperative to encourage attractions capable of drawing visitors on a twelve-month basis. Until recent years winter was a period of economic depression for most northern resort communities. Residents were often forced to leave their homes and seek employment in the southern urbanized portions of the state. In the late 1950's a higher standard of living coupled with increasing leisure time and other socio-economic factors initiated an unprecedented interest in skiing which resulted in an improved economic situation for basin residents.

The northwestern portion of the basin contains some of the finest skiing topography in the midwest. A majority of the basin's 22 ski areas are located in this area. Another concentration of winter sports facilities is located in the more populous southern section of the basin, the prime impetus being a closer market area. Plate 4-24 shows the distribution of basin skiing facilities.

The basin's topography and climate have attracted both skiers and facility development. Photo by Mich. Dept. of Natural Resources.

Plate 4-23

EXISTING SKI FACILITIES

LAKE HURON BASIN

Plate 4-24

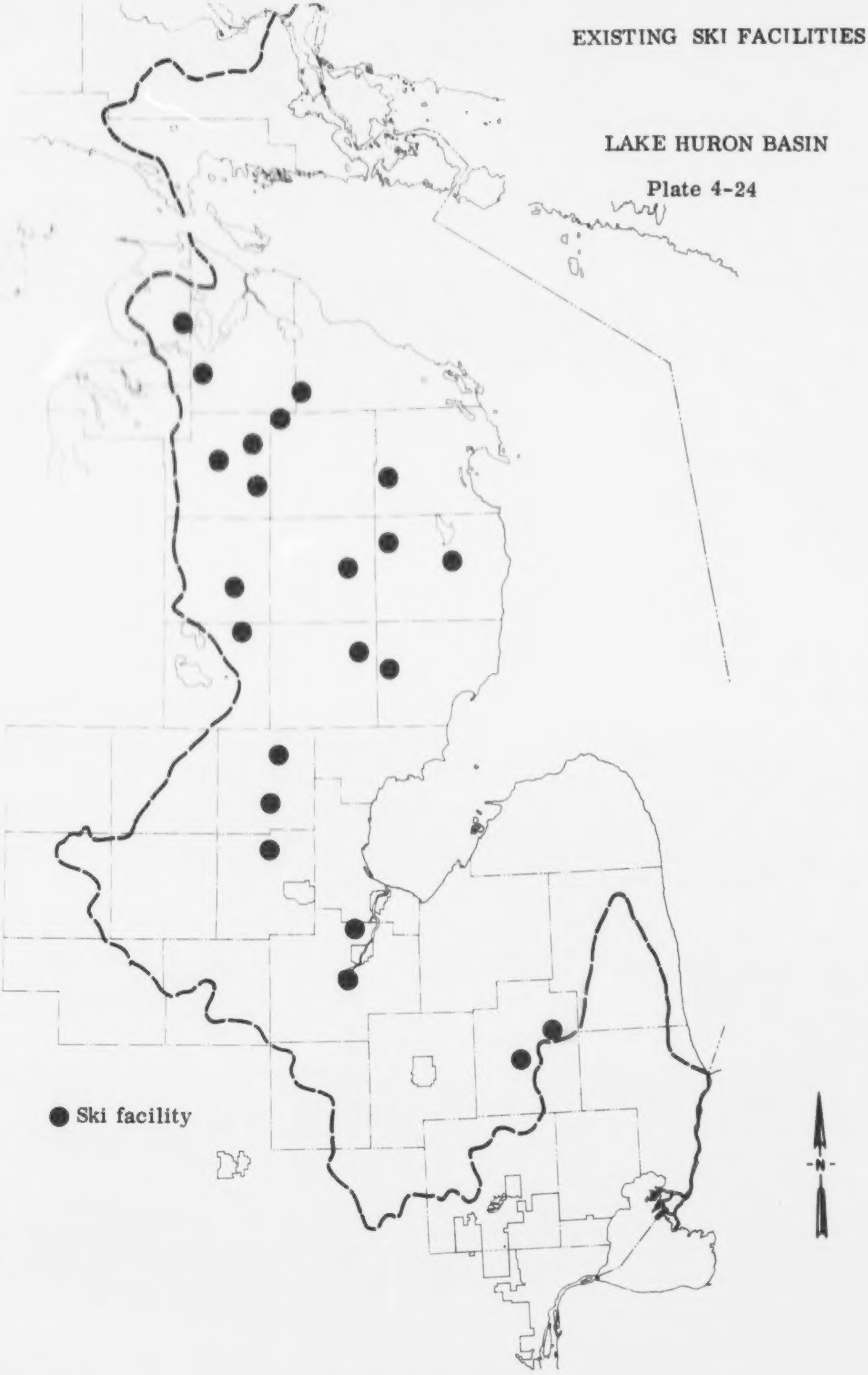


Plate 4-25

Snowmobiling lends itself well to family participation which has contributed to its unprecedented growth in popularity. Photo by the Michigan Department of Natural Resources.

The sport of snowmobiling is experiencing an unprecedented rise in popularity. With the exception of urban areas, the entire basin is capable of supporting this activity. Overcrowding, competition for land, and conflicting interests associated with the warmer recreation seasons are largely nonexistent. Presently resource management agencies are attempting to anticipate the incompatible aspects regarding the environment and various forms of recreation. In some areas trails have been designated and policies have been initiated to minimize disturbances of wildlife and damage to vegetation. These regulations are also designed to help in preventing accidents.

The economic impact of the snowmobile is significant. The small, drowsy, northern community of Wolverine is awakened on a wintry Saturday morning to find the streets bustling with activity, full of people eager to enjoy snowmobiling and willing to spend substantial amounts of money in the process. Restaurants, service stations, drug and grocery stores, resorts, hotels and motels, and entertainment businesses all prosper. A safari is planned for local residents and visitors alike. Midway through the day, all entrants stop at a ski chalet for lunch or to have an outdoor winter picnic catered by snowmobile. In the evening a smorgasbord and dance are planned; a night ride is often in order afterwards. On Sunday a shorter safari is planned so those who have early departure times may still participate. Derbies, races, and marathons are some of the other snowmobile activities which attract thousands of people to once dormant resort communities.

Tobogganing, sledding, ice skating, ice fishing, and ice boating are some of the other activities engaged in during the basin's winter season. Ice fishing is the only one of this group which has been able to entice participants from other regions into the Lake Huron Basin. Every winter a substantial number of the 208,000 acres of inland lakes are turned into towns of ice fishing shanties. Enterprising communities throughout the basin sponsor "shanty town Mardi Gras" which attract residents and nonresidents alike. Fishing contests and a host of social activities are porgrammed for the participants.

Large numbers of people take part in ice skating, sledding, and tobogganing in certain localities throughout the basin. The initial expense and the skill required to operate an ice boat, plus the sport's apparent danger, often discourage potential participants. Rough or thin ice and heavy snow cover are not conducive to ice boating; these obstacles further limit the amount of time an enthusiast can devote to the activity. In recent years the popularity of winter fishing on inland lakes has reduced the area available for ice boating. In the future, zoning of lakes in the winter season may become just as necessary as summer zoning, if all activities are to be accommodated.

PROPOSED AND POTENTIAL RECREATION AREAS

Public. The greatest need is for high and low density recreation facilities close to urban areas. The greatest emphasis is being placed on the development of water-dependent facilities.

State water access sites are unevenly distributed throughout the basin because of the irregular location of lakes and the polluted condition of many rivers and streams. Additional access sites will probably be demanded and provided when water quality is improved. It is also possible that waterfronts may be zoned. Recent goals for Lake Huron marina and harbor facilities cited in the Michigan Outdoor Recreation Plan specified that there be one such facility every 30 miles along the lake shoreline. Future plans call for recreational boat harbors every 15 miles when intensity of use justifies their construction. There will also be launching and docking facilities provided in every new and existing harbor (21).

The Lake Huron Basin lends itself particularly well to low density activities, and increasing emphasis is being placed on developing the facilities necessary for their support. State and National Forests are particularly well-suited for this type of activity. Examples of future developments are:

- (a) A new riding and hiking trail extending from Midland, Michigan to the Straits of Mackinac.
- (b) An increase in number and size of primitive campgrounds in state forests.
- (c) Establishment of a state wild rivers system.
- (d) Access roads for hunters and fishermen.
- (e) Specifically designated snowmobile trails

Recreation activities supported by intensively developed sites are usually the responsibility of state and local parks. Table A-7 in Appendix A contains a brief summary of proposed state acquisitions and additions to existing recreation lands.

From an acreage standpoint, future local developments will be smaller than federal and state projects. However, in terms of user satisfaction, local agencies provide the facilities which satisfy most of the high density activity demands such as swimming and picnicking. Some of the more important proposed local developments include:

Genesee County, in which the city of Flint is located, has initiated planning and acquisition programs for the purpose of establishing a 3,700-acre recreation area. Included will be a 750-acre reservoir on the Flint River. Water-dependent facilities are receiving special emphasis, but a full complement of recreation activities will be provided.

The city of Saginaw, which is currently experiencing an acute shortage of swimming facilities, is anticipating the construction of outdoor pools equipped with canopies which will facilitate twelve-month use. Also, a river front acquisition program is planned which will link 2.6 miles of publicly-owned parcels adjacent to the Saginaw River.

Bay City is planning construction of a swimming pool to partially compensate for the loss of once desirable lakeshore bathing areas.

With approximately 1,300 acres of recreation land, the city of Midland does not anticipate any significant acquisition programs. Emphasis is going to be placed on the installation of day-use facilities, since most of the city-owned property is undeveloped.

Plate 4-26 *Photo by BOR.*

This is one of a 50 to 100 unit complex of private vacation homes being built near a ski chalet in the basin.

Projected Private Developments. An important trend evident in the Lake Huron Basin is the rising popularity of vacation homes. Crowded public recreation facilities, degenerating urban environments, improved highway systems, and general prosperity have all added impetus to this trend. Traditionally, lake and riverside sites have been valued by the prospective cottage dweller. Demand for waterside sites promises to increase, but existing intensive development and the effort of public agencies to preserve the natural shoreline will counter much of the anticipated future development.

In an attempt to avoid this disparity between demand and supply, private land developers are experimenting with new techniques to meet the forthcoming needs. Cluster developments, reservoir or pond construction, and the use of nonwater-oriented facilities as a focal point of attraction are examples. The first two approaches are self-explanatory concepts, but the third requires further discussion. Ski resorts are an example of a nonwater-oriented focal point for vacation home construction. In an attempt to attract a larger clientele and extend their operating season, ski chalet owners are subdividing adjacent lands for recreational home sites. Not only will this encourage the use of their winter sports facilities, but it will also insure utilization of their chalet, restaurant, and lounge facilities on a four-season basis.

We are unable to anticipate new activities that have yet to be discovered. Some activities may experience a sudden drop in popularity and release their resources for other recreational activities. There is also the possibility of unexpected catastrophic economic depression which could drastically alter future programs of development and acquisition.

Chapter 5
Needs

GENERAL

The need for additional recreation facilities in the Lake Huron Basin is manifested in several ways. Campers turned away from state parks, long lines of swimmers awaiting admission to public municipal facilities, and vocal complaints of unsatisfied constituents are indicators of what is needed. Besides this increasing pressure for more facilities there is the overuse of existing facilities. Overuse causes deterioration of recreation sites.

PRESENT NEEDS

The needs of the Lake Huron Basin are a part of the total state needs which are discussed in the Michigan Outdoor Recreation Plan (21). The purpose of this chapter is to evaluate the basin's present and future requirements for outdoor recreation. The three zones show varying degrees of needs, and these are compared below. Some broad assumptions have been made in relating demand, supply, and needs. The methodology used to analyze the basin's needs is presented in Appendix B.

The figures outlined in Table 5-1 show the need for developed recreational acreage in the basin. Swimming, fishing, boating, picnicking, and camping were considered the basic activities in compilation of this table. A large deficit of developed acreage exists in Zone 2. Zone 3 has a sizable acreage deficiency, while a surplus of developed recreation acreage is indicated for Zone 1. However, it was noted in several instances that recreation facilities in Zone 1 were often overcrowded. There are also periods of peak use when campers were turned away from state parks. This results from a distribution problem within the zone. The heaviest pressures are placed on facilities close to transportation arteries. Parks and resource areas located greater distances from these major traffic routes are often only lightly used.

These acreages are considered necessary to support the maximum number of people expected to use recreational facilities at any one time on a normal summer Sunday. The acreages are based on the following classification of recreation areas suggested by Marion Clawson, et al., in Land for the Future.

(1) User-oriented areas, represented by city, county, and other local type parks, are usually located near the user, irrespective of the quality of resources available. User-oriented areas may be compared to Class I -- High Density Recreation Areas as defined by ORRRC in "Outdoor Recreation for America".

(2) Intermediate areas, represented by state and regional type parks, utilize the best available resources within a reasonable distance of the user. They may be compared to Class II -- General Outdoor Recreation Areas as defined by ORRRC. To some extent, intermediate areas may also include the more highly developed Class III areas.

(3) Resource-oriented areas, represented by national forests, are located in areas of outstanding resources. This category is based on location of resources and not necessarily on the needs of people. The Huron National Forest, Au Sable State Forest, and Thunder Bay River State Forest, all ORRRC Class III areas, are representative of this category. Estimates of developed acreages were made wherever recreational facilities existed in these areas.

Table 5-1

REQUIREMENTS FOR DEVELOPED RECREATION ACREAGE
LAKE HURON BASIN 1960
(Nearest 100 acres)

(1) Zone	(2) Total Needed	(3) Present Existing for Public Use*	(4) Deficit (Column 2 - Column 3)
1	4,000	5,900	-1,900
2	18,800	5,500	13,300
3	8,000	2,400	5,600
Basin	30,800	13,800	17,000

* See Table B-4, Appendix B.

The acreage presented as "Deficit" in Table 5-1 indicates the additional acreage needed in each zone if divided equally between user-oriented and intermediate types of areas. This approach was necessary because the classification of existing areas into the two types is not clear-cut. An intermediate area may be user-oriented for a certain portion of the population, and both types of areas can support essentially the same activities. In conjunction with the developed acreage necessary to support the five basic activities, other lands must be provided for the more extensive recreational uses such as hiking, hunting, sightseeing, and nature walks, as well as providing desirable buffer areas.

The deficit figures may change, depending on acquisition of new areas and use pressures. For example, if additional studies should show the user-oriented areas are needed in preference to intermediate ones, the figures could be lowered somewhat, or if intermediate areas required more attention, the figures could be raised.

The basin's most pressing needs lie in the area of development. Although some deficiencies remain, primarily at the local level, a substantial reserve of recreation land resources has been acquired for the basin. According to the Michigan Outdoor Recreation Plan (page N. 104.9), 71.7 percent of the 10-year state parks capital outlay recreation budget is earmarked for development. The balance (28.3) percent) is slated for land acquisition. In Table 5-2 the acreage needs expressed in this chapter are related to facility deficiencies listed in the Michigan Outdoor Recreation plan.

Table 5-2

ADDITIONAL NEEDS FOR DEVELOPED ACREAGE
LAKE HURON BASIN 1960

Zone	Developed Acreage needed*	Principal Facilities Needed
1	---	---
2	13,300	Boating, fishing, swimming camping, picnicking
3	5,600	Boating, camping, swimming

*See Methodology in Appendix B.

FUTURE NEEDS

Table 5-3 estimates future developed acreage requirements for each zone and for the Lake Huron Basin. Future needs for the five activities (boating, camping, fishing, picnicking, and swimming) considered in the preceding section will probably grow 277 percent by the year 2000 and by 2020 they may be expected to increase 500 percent over the presently needed acreage.

These projections are predicated upon continued growth of the basin's population and economy and also upon the assumption that the recreational demands exerted upon the basin will be totally satisfied within the basin. The total satisfaction of need within the basin will require considerable private enterprise in the ownership and operation of marinas, campgrounds, ski areas, etc. The demand methodology makes certain allowances for nonresidents seeking recreation in the basin, but what effect their numbers will have on the basin by 2000 or 2020 is not known.

Table 5-3

FUTURE REQUIREMENTS FOR DEVELOPED RECREATIONAL ACREAGE
LAKE HURON BASIN
(Nearest 100 Acres)

Zone	1960*	2000	2020
1	4,000	12,100	13,400
2	18,800	71,200	104,700
3	8,000	26,300	31,400
Basin	30,800	109,600	149,500

*From Column 2 of Table 5-1.

Chapter 6
Water Quality Influences

GENERAL

Basin Water Quality. Water quality problems in the Lake Huron Basin are concentrated in localized areas along the lakeshore, in portions of the numerous tributaries and inland lakes. The Saginaw River and its tributaries dissect and service every major city in the basin. These rivers are small and their assimilative capacity is limited. Metropolitan areas have outgrown the ability of the surface water resources to meet basic needs. Flint is an example of this. Many smaller communities bordering these tributaries are using them for water supply, waste assimilation, and recreation. All too frequently recreation has been sacrificed in favor of increased waste disposal activity. Soil erosion has seriously impaired water quality, particularly in the Saginaw River and its tributaries. Poor land use and treatment practives are largely responsible for the great quantities of soil reaching the waterways. Water quality problems in Lake Huron are attributed to wastes carried into it by its tributaries. Because of its sheltered waters, shallow depths, and the waste loads delivered by the Saginaw River, Saginaw Bay is the focal point of water quality problems in Lake Huron. Small streams, the Kawkawlin for example, also contribute to pollution of the Bay.

Some of the state's largest inland lakes are located in Zone 1. Here, water quality problems have not reached alarming proportion, but there are indications of potential problems. Light algae blooms have occured in lakes where they were previously unknown, indicating increasing nutrient concentrations. In the southern tip of Zone 2 there are several small lakes which are suffering the consequences of unplanned resource developments. Inadequately treated effluents entering tributary streams and poorly designed lakeshore septic tank systems are responsible for many of the water quality problems presently being experienced.

Sources of Pollution. There are three general sources of polluting substances: domestic, industrial, and agricultural. The most widely distributed pollution in the Lake Huron Basin stems from domestic sources; both municipal and individual systems are involved. Industrial contaminants are often more dramatically evidenced but sparsely distributed. Sedimentation of rivers in agricultural areas is concentrated in Zones 2 and 3.

Inefficient or inadequate sewage treatment plants and faulty individual septic systems are degrading lakes and rivers throughout the basin. They contribute oxygen-consuming organic substances, health endangering bacteria, and nutrients which induce luxurious plant growths. While enforcing pollution abatement laws against municipalities is difficult, inspecting individual septic sanitary systems will prove to be the most demanding task. Lakeshores and river banks are often lined with cottages and permanent houses, many with septic systems draining directly into the adjoining surface waters. The cost involved in placing these homes on a collective sewage treatment system is often claimed to be prohibitive. Although potentially effective in controlling new construction, sanitary zoning ordinances involve serious ramifications when applied to existing residences and have not proven to be a deterrent to undesirable developments. As municipalities extend their services to outlying areas, some shoreline residences will be connected to a central waste control system. Unfortunately there are many areas where this expansion of interceptor systems will not occur in the foreseeable future.

The presence of considerable amounts of nutrients in the waters of much of Zone 2 and the southern and eastern portions of Zone 3 in the Lake Huron Basin has resulted in substantial growth of algae and other undesirable weed growths. The Flint, Shiawassee, Pine, Chippewa, and Tittabawassee Rivers in Zone 2 and the Cass and Saginaw Rivers in Zone 3 all exhibit some evidence of algae and other undesirable aquatic vegetation at various locations along their length. The intensively farmed areas of the Saginaw River Valley and the heavily cultivated portions of southeastern Michigan are major sources of farm runoffs and undoubtedly contribute to the enrichment problem. In addition, inadequately treated sewage effluent of municipalities and industries, phosphates from household detergents, and the runoff into river basins of such seemingly harmless products as lawn fertilizers containing considerable amounts of nutrients are entering the above-named rivers.

The cities of Flint, Saginaw, Midland, and Bay City contain the basin's greatest concentrations of industrial and munufacturing concerns. In addition, petroleum refineries, wood-using industries, food processing plants, quarrying installations, and small manufacturing operations are located in other portions of the basin. Metal plating chemicals, heavy metal, paper mill wastes, phenols, thermal additions, and assorted other contaminants have been or are pollutants for which the basin's industries are responsible.

In 1960 there were 4.4 million acres of artifically drained land in the Lake Huron Basin (32). Drainage ditches have provided an avenue for the collection of silt, organic matter, and nutrients. Housing projects and other construction in the vicinity of rivers and lakes are often characterized by thoughtless removal of vegetation and little concern for the surrounding environment; waters downstream from construction sites often run thick with silt from eroding soils.

Another source of pollution for which municipalities, industries, and private individuals are all responsible is that of general refuse: tin cans, no-return bottles, old automobiles, paper, garbage, and other assorted by-products of our society. River banks and flood plains have long been a favorite location for trash disposal. Beaches, picnic areas, campgrounds, and other recreation facilities suffer from waste deposition. Ironically, recreation lands and waters are often littered by the same people searching for a natural environment in which to recreate.

EFFECTS OF WATER QUALITY ON RECREATION

Swimming. The most common water quality problem affecting swimming and other body contact activities is bacteriological contamination. Pathogenic organisms associated with human intestinal wastes can cause serious health problems if present in bathing waters. Swimmers, water skiers, and skin divers are all susceptible to a variety of illnesses: gastro-intestinal inflamation, typhoid fever, infectious hepatitis, and dysentery are some of the diseases known to be transported in surface waters.

Often ignored in surveillance and monitoring problems are those substances which are by-products of our technologically advancing society. New chemicals, industrial processing wastes, and agricultural pesticides are reaching surface waters in increasing quantities. Some of these materials can cause serious injury to anyone swimming in or ingesting the untreated water. Esthetic degradation of bathing water often deters swimming activity much more quickly than potential health hazards. Floating debris, turbidity, obnoxious odors or encroaching vegetation have eliminated swimming in many areas regardless of the water's bacterial content.

Hunting and Fishing. The proper environment for fish and game is what dictates the water quality requirements. Any significant change in the biochemical composition of natural waters can decimate the native biotic community. These variables include water temperature, oxygen content, turbidity, and pH. Waters preserved for aquatic life and dependent terrestrial species require constant surveillance as these organisms are the first to feel the heavy hand of pollution.

Boating. Two primary concerns of the boater are that the water be esthetically desirable and that it be free from any materials which could damage his equipment. Extreme acidity or alkalinity can both damage equipment and contribute to an undesirable esthetic situation. The same can be said for floating debris, excessive aquatic plant growths, and a wide range of chemicals. Except in the case of an accident where the recreator may come in contact with the water, considerations given to health have received less attention.

Water-Enhanced Activities. Camping, picnicking, hiking, and other water-enhanced activities are most actively pursued in areas adjacent to esthetically attractive waters. McKee and Wolf have delineated the water quality requirements necessary for esthetic enjoyment of water-enhanced activities. Conditions of water quality that adversely affect water-enhanced activities are: visible floating, suspended, or settled solids arising from the disposal of sewage or garbage; sludge banks; slime infestation; heavy growths and attached plants or animals; blooms of high concentrations of plankton; discoloration or excessive turbidity from sewage, industrial wastes, or even natural sources; the evolution of dissolved gases, especially hydrogen sulfide; visible oil or grease, including emulsions; excessive acidity or alkalinity that leads to corrosion or delignification of boats and docks; surfactants that form when the water is agitated or aerated; and excessive water temperatures that cause high rates of evaporation and cloudiness over the water (15). Participation is greatest when the waters support a desirable aquatic community and are safe for water-dependent activities. Camping or hiking may be the primary objective of a vacation, but the choice of site or route is often determined by the availability of high quality waters suitable for a variety of uses.

WATER QUALITY PARAMETERS

There are two independent qualities which must be assured in recreation waters: the absence of health hazards and desirable esthetic features. Many pollutants have a detrimental effect on both of these desired qualities. A listing of contaminants and some of their harmful effects is found in Table 6-1. Only the more common substances known to gain entry into basin waters are considered. It should also be understood that the headings used in the contaminant column, e.g. pesticides, and the following listed effects are general in scope and are not to be construed as all-inclusive.

Table 6-1

CONTAMINANTS	EFFECTS
Phenols*	Impart obnoxious odors and tastes to the water and the fish within. Are also toxic to fish in very small concentrations.
Acids and alkalines*	Toxic to aquatic life and damaging to recreational equipment.
Heavy metals, e.g. lead, zinc, arsenic, and chromium	Toxic to fish, wildlife, and humans.
Oxygen-consuming substances* e.g. starches, sugars, and also previously mentioned soil particles and human wastes	Detrimental to fish and other aquatic life, and can cause odor and taste problems.
Chlorine	May be detrimental to fish and other aquatic life. Causes eye irritation in swimming pools.
Dyes	Some varieties are toxic to fish and all affect the water's natural color.
Temperature-warmed water	May impair esthetic quality of swimming water, and has a deleterious effect on other elements contained within the body of water. Extremes eliminate aquatic life. Under certain conditions may be beneficial for swimming in cold bodies of water.
Radiation	Certain rays or radioactive substances above certain levels may be detrimental to aquatic plant and animal life and a threat to human health.
Pesticides*	Harmful to all forms of aquatic life and any organisms ingesting the water, including humans.
Human digestive wastes and associated bacteria	Obnoxious odors, visually unsightly, detrimental to human health and aquatic life.
Soil	Visually unsightly, detrimental to aquatic life, and sedimentation blocks navigable waters.
Oils*	Injurious to fish and wildlife, esthetically displeasing, and can damage recreation equipment
Nutrients, including fertilizers*	Stimulate nuisance aquatic growths which are esthetically and physically detrimental to recreation activities.

*Also found combination with several other general polutants.

It is difficult to determine exactly when each of these polluting substances becomes concentrated enough to be harmful. Reactions often take place between chemicals that cause them to be much more dangerous in combination than they were individually. Warmed waters, for example, may start or intensify a chemical reaction that would ordinarily be subdued by the water's natural temperature. Each body of water and each entering foreign entity must be approached on an individual basis if deleterious effects are to be accurately analyzed and corrected.

REPRESENTATIVE CASE STUDIES

Flint. The Flint River, Kearsley and Thread Reservoirs, and Flint Park Lake either pass through, border, or are located within the city of Flint. At one time all of these waters supported a variety of water-oriented outdoor recreation activities. The Flint River was used for swimming, sport fishing, boating, and other activities associated with good quality waters. Because of its small size and muddy bottom, Flint Park Lake received only light recreational use. At present not one of these waters is recommended by the Flint Park and Recreation Department for water-contact sports. Poor water quality is the most important factor contributing to the loss of these waters for recreation purposes. This degradation of natural waters is another reason for people to seek weekend recreation away from the cities.

Swimming pools, golf courses, and ball parks meet some of the demands generated by the citizens of Flint. A reasonably large body of safe, esthetically attractive water bounded by sand beaches, a marina, public boat launching sites, and picnic grounds would be an invaluable supplement to the city's recreation system. Every resource and facility previously mentioned existed in the past and could exist in the future provided water quality is improved. As was mentioned in Chapter Four under Recreation Potential, Genesee County and the City of Flint, in anticipation of improved water quality, are planning construction of a reservoir on the Flint River which will have recreation as its primary purpose.

Of particular interest on the periphery of Flint is Kearsley Lake, a 200-acre reservoir originally designed for low flow augmentation. Recreationally, it once supported a number of private and commercial beaches, hosted an annual racing regatta, and provided boating and fishing opportunities. The water quality has since degenerated to the point that many recreation demands can no longer be satisfied. In 1956 a survey was made by the City Water Department to determine the sources of pollution which were degrading the reservoir's water quality. It was discovered that the residences bordering both the reservoir and Kearsley Creek had inefficient sanitary septic systems which were channeling wastes directly to surface waters. It is estimated that nearly 20,000 swimming occasions annually are lost to outdoor recreationists because of the presence of these pollutants. If this problem was corrected, Kearsley Reservoir could once again be used extensively for recreational purposes.

Thread Lake, administered by the City Recreation Department, is 115 acres in size and located entirely within the city of Flint. Poor water quality and sedimentation have significantly reduced this lake's recreational potential. Faulty septic tank systems bordering its tributary streams are contributing domestic wastes to the lake. Like Kearsley Reservoir, Thread Lake once supported a variety of water-oriented recreation activities. It could do so again if the lake were dredged and, foremost, if the water quality were improved.

This site on Kearsley Reservoir was once a heavily used commercial beach and is presently owned by the City Parks and Recreation Department, but it remains undeveloped.
Plate 6-1 *Photo by BOR.*

Saginaw. The Saginaw River, in combination with its tributaries, is one of the few significant sources of recreational waters close to the Saginaw urban area. Inland lakes represent only 1,479 acres of surface water of which almost half is flooded lowlands devoted to wildlife propagation. The remaining acreage consists of small ponds and lakes averaging less than 15 acres in size (26). The value of the Saginaw River as a recreational resource has been recognized by the city's Parks and Recreation Department as is evidenced by their waterfront acquisition program. Boating water skiing, picnicking, walking for pleasure, and assorted other activities are supported by the river and adjacent waterfront areas. Swimming is discouraged because of unpredictable currents and fluctuating water quality. Undesirable esthetic conditions (primarily turbidity) and upstream municipal and industrial discharges further limit the recreational use of the river.. The cities of Gladwin, Midland, Alma, Flint, Lapeer, and several smaller communities above Saginaw use the Saginaw River and its tributaries for waste assimilation (31). The drainage of 1,989,000 acres of in-

Plate 6-2

A sign seen much too often in the Lake Huron Basin. Photo by BOR.

tensively farmed cropland contributes substantially to the river's turbidity.

Bay City. The quality of the Saginaw River deteriorates as it flows northward to Saginaw Bay. Bay City residents and visitors alike generally consider the river esthetically undesirable, even for water-enhanced activities. The discharge of Saginaw River water in conjunction with that of the domestically polluted Kawkawlin River into Saginaw Bay has discouraged beach attendance at Bay City State Park. Attendance figures for the years 1961 through 1966 given in Table 6-2 exemplifies this problem. General public opinion regarding natural waters and their suitability for recreational activities is evidenced by the abandonment of the municipal beach on Lake Huron and planned construction of swimming pools.

Alpena. Alpena and several other cities suffer from irresponsible actions committed decades ago. During the 19th century, Alpena was one of the major centers for lumbering and associated industries. By-products from the lumber processing industry (chips, sawdust, slabs, etc.) were deposited in Thunder Bay. Today local parks and recreation officials are continually burdened with the task of removing water-logged debris from the public beaches.

Table 6-2

ATTENDANCE TRENDS OF BAY CITY STATE PARK AND THE MICHIGAN STATE PARK SYSTEM, 1961-1966

Year	Bay City State	Percent Change	Total State Attendance	Percent Change
1961	287,045		13,465,872	
1962	312,620	+ 8.7	13,081,438	- 2.8
1963	327,025	+ 5.0	13,565,622	+ 4.0
1964*	245,410	-25.0	13,844,262	+ 2.0
1965	228,900	- 6.9	13,583,862	- 1.9
1966	261,400	+13.9	16,457,452	+22.0

* Beach was posted on May 28 through June 26, indicating a potential health hazard.

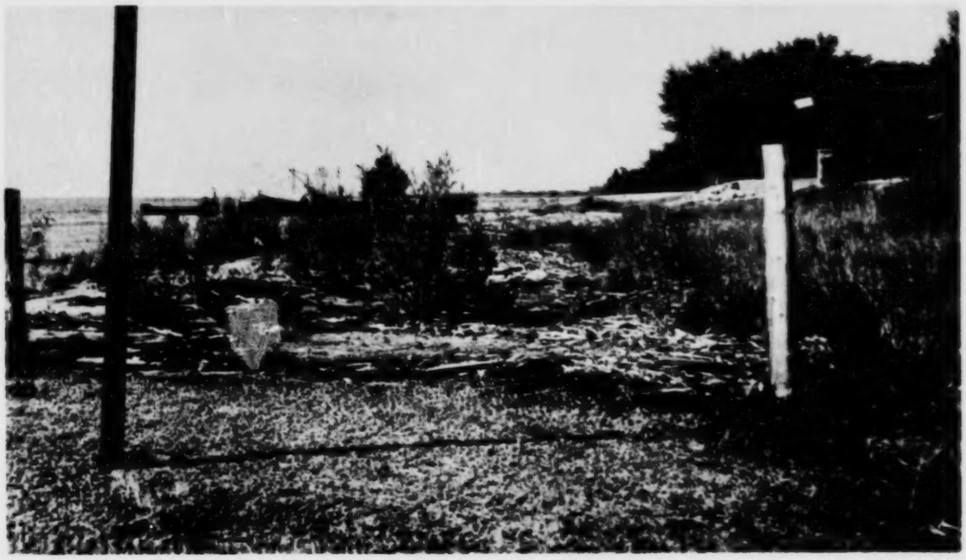


Plate 6-3

In the foreground is a segment of maintained municipal beach at Alpena. Beyond the post lies a beach which is not continually cleared, raked, and turned over.
—Photo by BOR.

Harbor Beach. High coliform counts and large accumulations of aquatic plants indicate a water quality problem at Harbor Beach. Table 6-3 presents the findings from water samples taken by the Michigan Water Resources Commission. The counts consistently exceeded accepted levels for whole body contact recreation activities. Subsequent studies revealed that industrial wastes were largely responsible for the high coliform counts. The city's efficient waste treatment plant chlorinates its effluent, and the human wastes of industry are also treated at this municipal treatment plant. After preliminary investigation it appears that there are two other sources of bacterial contamination: recreation craft in the harbor and unsewered seasonal residences along the lakeshore.

The black debris degrading this Alpena beach is primarily wood chips, slabs, and sawdust deposited in Thunder Bay several decades ago. Photo by BOR.

Plate 6-4

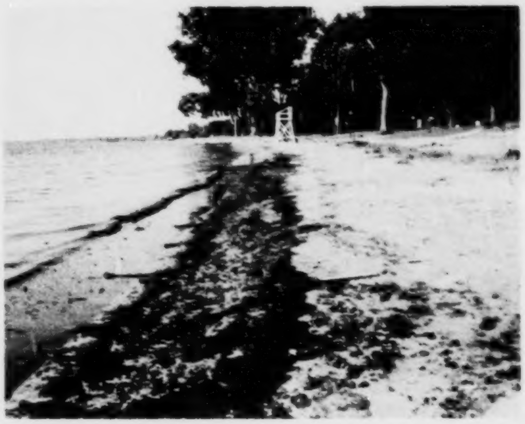


Table 6-3

BACTERIOLOGICAL DATA FOR HARBOR BEACH
(1965-1966)

Date	Coliform Counts Organisms/100 ml.
7-28-65	110,000
8-23-65	12,000
6-30-66	1,400
7-11-66	4,100
7-25-66	4,000
8-08-66	44,000
8-23-66	75,000
9-08-66	2,000
Average	26,250

Source: (30)

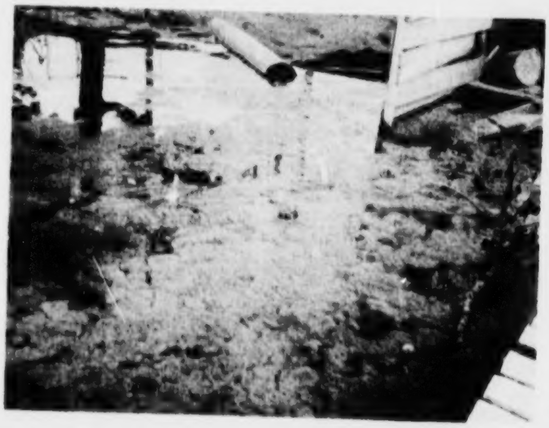
Note: These counts exceed water quality standards as determined by the Michigan Water Resources Commission. These standards state that the geometric average of any series of 10 consecutive samples shall not exceed 1,000; nor shall 20 percent of the samples examined exceed 5,000/100 ml for total body contact. The high counts obtained on the dates 7/28/65 and 8/23/66 appear to be inconsistant with the other samples obtained. If errors were made in sampling, the numerical value of the remaining samples are still high and very definitely indicate a problem.

Small Lakes in the Southern Shiswassee River Basin, Genesee County. A series of small lakes in a glacial moraine area of Genesee County are aging prematurely. Slimes, weed growths, and resulting odors discourage the recreational use of these waters. Effluent from an inefficient primary treatment plant, faulty septic tank systems, and surface runoff have all contributed to this situation. Private groups, in cooperation with governmental agencies, have begun to attack these problems; but there is still much to be done.

Fenton Lake, a small morainal lake with no inlet and a very small outlet is supporting substantial growths of algae and rooted aquatic plants. The individual septic tank systems used for domestic wastes could be contributing substantial quantities of nutrients to the lake. An

This Lake Fenton scene shows plant growth by an outlet of a county drain. It appears that substances other than storm water are emitted. The area on both sides of this drain is a beach for residents of an adjacent suburb. Photo by BOR.

Plate 6-5



obvious source of pollutants is storm water runoff entering via two county drains. It appears more than storm water is being discharged from these drains, but even if this is not the case, harmful constituents carried by runoff waters are more than sufficient to cause problems in a lake of this type. With little or no circulation the lake is never sufficiently flushed; hence the buildup of nutrients and a relatively stagnant condition -- an ideal situation for plant growth. Diversion of the drain water has been suggested as a solution, but this would only transfer the problem to people farther down the subbasin.

WATER QUALITY IMPAIRMENT

In Chapter 1 water pollution was defined as the addition of any material or any change in the quality or character of a body of water which interferes with, lessens or destroys a desired use. This implies that if there is no impairment of use there is no pollution. Throughout the Lake Huron Basin are sources of contamination which have actually impaired the basin's waters for recreational purposes. Plate 6-6 shows present degrees of impairment. These degrees have been divided into three categories: light, moderate, and gross. Definitions of these follow:

WATERS LIGHTLY IMPAIRED are those which can support recreational activities involving total body as well as partial body contact. In some instances these waters may not be esthetically pleasing during part of the recreational season because of certain activities such as: mining, gravel washing, canning, sewage treatment, or similar activities which may preclude their use by some recreators.

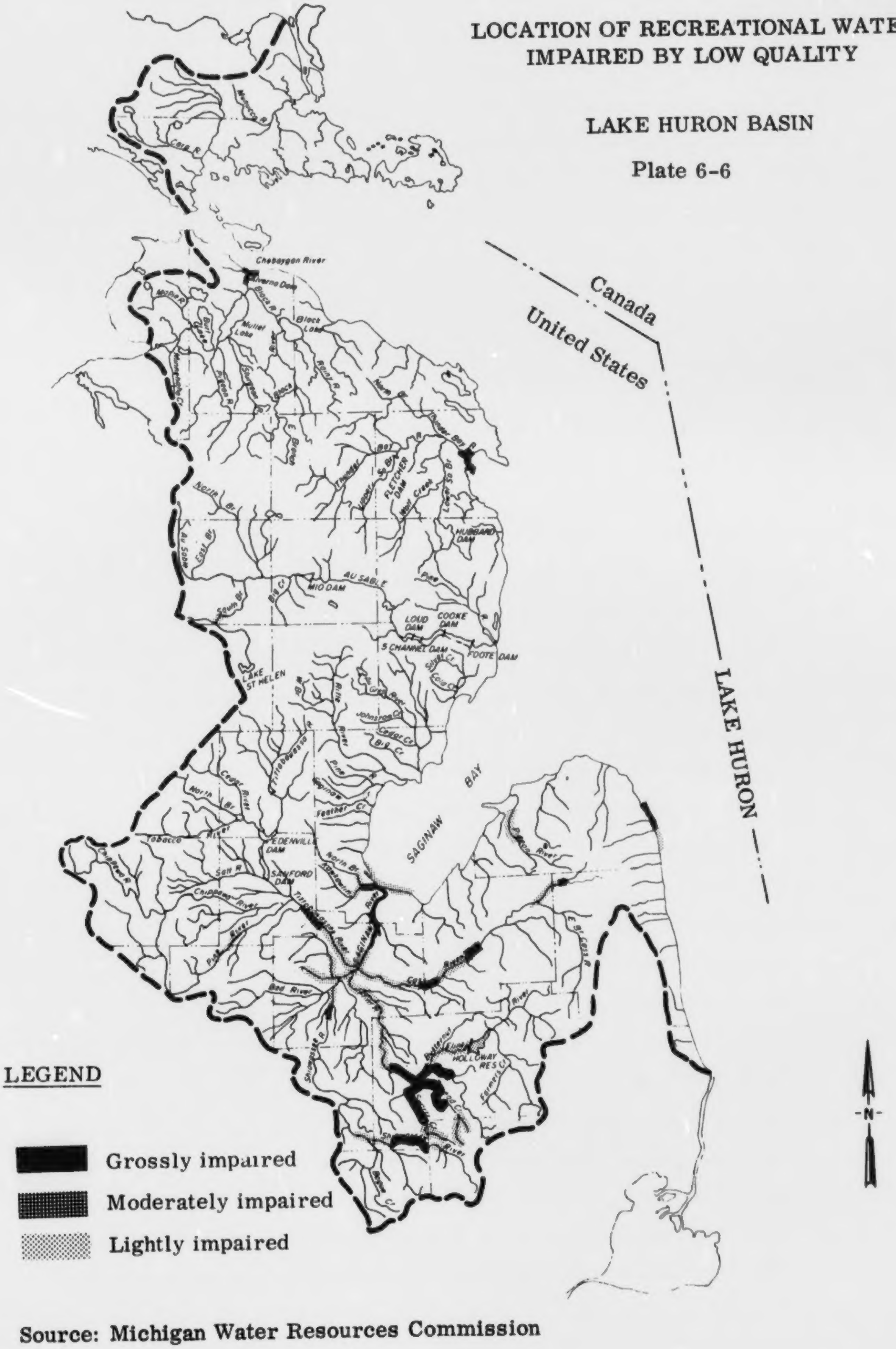
WATERS MODERATELY IMPAIRED are those at which recreational activities involving total body contact with water is deterred because of health considertions. Some persons might engage in water activities involving partial body contact, but most people would shy away from such activity because of esthetic impairment.

WATERS GROSSLY IMPAIRED are those at which recreation activity involving whole body contact with water is deterred because of health considerations and which nearly all people involved in water recreational activities would shun. Such waters would be esthetically displeasing because of algae growth, dead fish, oil slicks, floating debris, raw sewage, or other similar conditions.

LOCATION OF RECREATIONAL WATERS IMPAIRED BY LOW QUALITY

LAKE HURON BASIN

Plate 6-6



Source: Michigan Water Resources Commission

PRESENT ABATEMENT PROGRAMS

The state's water pollution abatement program is well underway. Many municipalities and industries have been ordered by the Michigan Water Resources Commission to install new waste treatment systems or update their existing facilities. In anticipation of improved water quality, some communities are planning recreation developments which will provide facilities for water-dependent activities on lakes and rivers presently considered polluted. The recent passage of a $335 million pollution bonding program in November 1968 by the citizens of Michigan will provide a significant step forward. This will provide greatly needed money for improvements on existing sewage treatment facilities as well as the construction of new sewage treatment plants. The United States Department of Agriculture and the State of Michigan Department of Agriculture through numerous subagencies have long encouraged improved land use practices with considerable attention given to erosion control. Dependence on the voluntary efforts of individual land owners has not always been the most effective technique for insuring wise resource utilization, as evidenced by many of the basin's rivers. However, increased promotional and educational efforts on the part of the aforementioned agencies could substantially alleviate many of the sedimentation problems presently degrading the basin's central and southern waters.

Industry is also beginning to recognize the public relations value of a responsible approach to waste control and the environment in general. One of the basin's most efficient, conscientiously-operated waste treatment systems is the pride of a large chemical company, the Dow Chemical Company.

Interest and action initiated by private individuals, associations, and industries can and, in some instances, have fostered tremendous changes in the general public's attitude toward the surrounding environment. An example of a private group actively engaged in the promotion of pollution abatement is the Ponemah-Squaw-Tupper Lakes Improvement Association, a group composed of local lakeside home owners. Upon witnessing the deterioration of the lakes on which they live, property owners organized an action group to promote and implement programs which could reverse the trend of water pollution. Studies and surveys were made to locate the sources of pollution, and a plan was formulated to eliminate or control discharges of contaminating substances. This was followed by a promotion campaign which has contributed to the construction of a new sewage treatment plant. Their efforts have resulted in a lake level stabilization structure, sewage diversion system, and a planned sanitary district to service lakeside homes. The efforts of the Ponemah-Squaw-Tupper Lakes Improvement Association have been recognized by others living on similarly distressed lakes; and they, too, are now organizing in an attempt to rectify the errors of the past.

Through the actions and cooperation of federal, state, local, and private interests can come the quality of waters necessary to support, not only recreation activities, but all other uses, including domestic and industrial. There are indications that desirable action and cooperation either exists or is forthcoming and as a result the basin's rivers, inland lakes, and Lake Huron itself can become a greater source of pleasure to all.

Clean water is the key to greater enjoyment by all persons. Photo at right by Michigan Department of Natural Resources. Photos below by the Mich. Tourist Council.

Plate 6-7

Chapter 7
Outdoor Recreation Plan

APPRAISAL OF RECREATION POTENTIALS

The recreation potential for the Lake Huron Basin has yet to be significantly tapped. Lands in excess of two million acres are publicly owned and capable of supporting a variety of recreation activities. This wealth of resources is concentrated in the less populous northern portion of the basin. Only 14,000 acres in the basin are presently intensively developed for recreation. Developed recreation acreage could double, triple, or quadruple without taxing existing resources or infringing on low density activities. However, as interests and participation in the low density activities increases, overcrowding may occur, resulting in low quality experiences. Urban development will also have a detrimental effect on the basin's recreation potential if it does not proceed in a more rational manner than it has in the past. In the near future several outstanding programs will be undertaken which will significantly affect the recreational complexion of the Lake Huron Basin. A discussion of two notable developments follows:

Great Lakes Sport Fishery. One of the most exciting chapters in the story of recreation is being written. Concerned agencies are implementing ambitious plans for a new sport fishery which should flourish. The introduction of Coho and Chinook Salmon into Lake Michigan waters has resulted in success that has far exceeded expectations. These species of salmon were more recently planted in Lake Huron, and good results are anticipated. These programs, in combination with the recovery of native fishes should continue to provide an outstanding recreation resource. Another important factor in the future success of the sport fisheries program is the control of the sea lamprey. In the past few years, control measures have achieved notable results. However, a recent reduction in funds has caused a cutback in the Lake Huron lamprey control program.

Rehabilitation of Basin Waters. Through an active program of pollution abatement directed and enforced by the state of Michigan Water Resources Commission, many of the rivers, streams, and lakes presently unfit for recreation activities can once again enhance the environment and support those uses which demand high quality waters. A complete discussion of water quality and its effects on outdoor recreation is found in Chapter 6.

Zone 1. Extensive forested lands, varied topography, numerous lakes and streams and the last remnants of unspoiled Lake Huron shoreline, all combine to make Zone 1 the most recreationally desirable area in the basin. Another factor favorably contributing to the zone's recreational potential is the large acreages held in public trust. A great threat to this potential is the unplanned, haphazard proliferation of seasonal homes. A small number of vacation residences can consume disproportionally large amounts of valuable recreation lands. Pressures are already being put on public agencies to force the sale of public lands to private interests. Although the demand-supply analysis indicates a surplus of developed recreation land in Zone 1, it should not be assumed that future recreational demands will be easily satisfied. Increasing popularity of low density activities which require extensive acreages indicates tremendous demands for undeveloped lands.

Zone 2. Intensive farming, generally flat topography, scarcity of surface waters, and population density all have depressing effects on the potential for recreational development in Zone 2. Efforts to provide the 13,300 acres of developed recreation land needed to satisfy present demands will be significantly retarded by these factors. The most promising action regarding resource availability is the rehabilitation of the zone's degraded waters, thus providing areas for development which are presently considered unsatisfactory for recreational purposes. Possibly reservoir construction, similar to that in Genesee County could further alleviate the need for recreational water resources. Zone 2 also suffers from acute unregulated urban sprawl. Desirable lands on the periphery of the zone's cities are being consumed by residential, industrial, and public developments, often without adequate regard for the recreational resources that are being preempted.

Zone 3. The many miles of Lake Huron shoreline and the excellent waterfowl habitat and fishing waters of Saginaw Bay are admirable resources associated with Zone 3. Unfortunately, most of the shoreline is already privately or publicly developed to a degree that quite limits its future potential. The Rifle and Au Gres subbasins represent the most promising remaining potential. The resources necessary to alleviate the present 5,600-acre need for developed recreation lands are available. Pollution abatement programs will allow more extensive recreational use of the many small tributaries, shoreline lake waters, and Saginaw Bay.

SUPPLEMENTAL CONSIDERATIONS

Location of Recreation Facilities. Urban areas have long suffered the inequitable distribution of recreation facilities. Rising urban land prices, mobility, and availability of desirable resource-oriented lands in less densely populated areas have stimulated this trend. The basin's cities are moderate in size and just beginning to experience an acute need for recreation facilities. In many instances, the resources are available, and all that remains to be done is saving them for recreation use.

Resource Aptitude. The Lake Huron Basin has certain resource characteristics which should be taken into consideration when future recreation developments are contemplated. The lake itself contains relatively cold water and is encircled by horizontally shallow beaches. Offshore waters are underlaid with sedimentary deposits conducive to plant growth as evidenced in the lake's bays and inlets. These are conditions far from attractive to the swimmer but desirable for other water-dependent and water-enhanced activities, e.g., picnicking, camping, fishing, and hunting.

The interior of the basin and its 8,000-mile system of tributaries are valuable resources ideally suited for low density recreation activities, e.g., hiking, trail riding, primitive camping, canoeing, and fishing. On the periphery of cities and a number of resource-oriented areas, high density facilities are necessary to satisfy resident demands. The vast tracts of public forests and other large holdings of undeveloped land can best serve the region by supporting those activities which require one or a combination of the following four conditions: adequate acreages per recreationist, a pleasant natural setting, fish and wildlife habitat, and privacy.

Permanent and Seasonal Home Development. The Lake Huron Basin is experiencing a deviation from the normal pattern of urban sprawl, i.e., people are bypassing the suburb and building homes in rural areas. This desire for a "country estate" has resulted in the removal of many recreation amenities once available to urban residents. Seasonal homes are still being built at a rapid rate. The bulldozing of all trees and vegetation for rows of crowded, look-alike housing in subdivisions is continuing unabated. Efforts to control this type of development have been largely ineffective. Zoning ordinances are sometimes ignored for the short term economic benefits of contractors and realtors. Aside from direct acquisition, a successful system of land use control has not been found.

Throughout Michigan are found a considerable number of private and semiprivate lakes having excessive numbers of seasonal or permanent homes lining the shoreline. In many instances these cottages and cabins are utilizing inadequate or poorly placed septic systems, with some even piping wastes direcly into lake waters. Not only are lot sizes in many cases far too small, but buildings are usually constructed too close to the water's edge. This carelessness and shortsightedness has resulted in the unattractive cluttering of shorelines and the unnecessary pollution of lake waters. For lakes not yet in such a condition, passage of effective shoreland zoning ordinances properly enforced by the state can help in eliminating these infringements of the lakeside environment. For those lakes already developed, zoning ordinances cannot undo what is already in existence. However, a possible solution to the pollution problem on developed lakes or those lakes to be developed would be the development of an economical central sewage treatment system. If such a system could be installed at a reasonable cost, all riparian owners and public users could enjoy water-oriented outdoor recreation of a much higher quality. The elimination of the cost now incurred for installing and maintaining septic systems might aid in offsetting the cost of a central sewage treatment system. More importantly, if existing and prospective lakeside owners are made aware of the added benefits and enjoyment that can result from such a system, increased costs to the owners would probably not prove to be a deterrent to their acceptance.

Wild Land Trends. There is a significant trend occuring in Michigan, which each year further limits the amount of wild lands available to the public for hunting and other recreational uses. A recently completed survey of Michigan's wild lands by the state's Department of Natural Resources indicated a 64 percent increase in the amount of fenced private wild land acreage in Region II of the lower peninsula during the period of 1954-1963. (Region II includes the major portion of the Lake Huron Basin and nearly the same trend could be expected in the basin.) In 1963, 1,627,702 acres were fenced as compared to 1,047,670 acres in 1954.

Wild lands comprise approximately 60 percent of the basin's total land area, but the proportion which fenced private wild lands comprise of total wild lands (public and private) is considerable. To illustrate, in 1954, 14.4 percent of the total wild lands were under fence as compared to 22.3 percent in 1963. This loss of lands is occuring just at the time when greater demands are being made upon the basin's land and water resources.

Zoning Considerations. The introduction and passage of legislation designed to enhance the natural beauty and outdoor recreation use of flood plains and shorelines in not only the Lake Huron Basin but in the entire state of Michigan should receive consideration. Whereas various state laws exist which are designed to protect flood plains and shorelines from the encroachment of undesirable practices, their principal purpose is not to enhance, but only to protect -- the laws do not provide specific provisions which enhance natural beauty and recreational use. *

The Subdivision Control Act of 1967 (Act 288, P.A. 1967) is a recent Michigan law which bears a relationship to the use of land and water for recreational purposes and may aid in improving environmental quality. The two provisions which could have this effect are (1) The Department of Public Health may require percolation and boring tests prior to the installation of septic systems in a particular area and (2) The Michigan Water Resources Commission will be given authority to approve or reject a preliminary subdivision plat, giving the necessary reasons if rejected.

In 1962 the state of Wisconsin enacted a bold and imaginative law to protect the clear waters and natural beauty of its rural shorelands. Shorelands, as defined by the law, are lands within 1,000 feet of a lake, pond, or flowage and lands within 300 feet of a river or stream or to the landward side of the flood plain, whichever distance is greater. The stated purpose of the statute is to "...further the maintenance of safe and healthful conditions; prevent and control water pollution; protect spawning grounds, fish, and aquatic life; control building sites, placement of structures, and land uses; and preserve shore cover and natural beauty" (65, 66). The provision for such controls will have a direct bearing on the quality of outdoor recreation in the areas affected.

The law requires special county zoning for the unincorporated shorelands of all navigable waters. The law applies to most waters in the state since any water

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*Act 247, P.A. 1955, as amended - The Great Lakes Submerged Lands Act.
Act 291, P.A. 1965, as amended - The Inland Lakes and Streams Act.
Act 167, P.A. 1968 - Amendments to Act No. 245 of the Public Acts of 1929 (Water Resources Commission Act).

which is capable of "floating any boat, skiff, or canoe of the shallowest draft used for recreational purposes" is navigable by the Wisconsin legality test. Either failure to adopt an ordinance, or the adoption of an inadequate ordinance by a county, will result in adoption of an ordinance for that county by the Division of Resource Development. If needed, the division is directed to provide substantial assistance to the counties.

The law provides for zoning regulations such as: (1) the determination of a particular soils' suitability to support septic systems prior to the installation of such systems, (2) tree cutting limitations to preserve shore cover and natural beauty and to aid in controlling erosion, (3) providing minimum setback distances of various structures from the water's edge, (4) the setting of minimum lot sizes, (5) filling and grading provisions and lagooning and dredging provisions aimed at controlling erosion, and (6) the use of subdivision controls such as cluster development. The law can only be applied to those areas not yet developed, and will be limited in its application in the southern, more developed portions of the state. This law should provide a useful tool for restricting improper land use which might infringe upon valuable shorelands in the undeveloped portions of the state.

In order for the law to be operational, especially at the outset, it appears that some means of enforcement will be essential. In addition, an appreciation by the public for what this program can do, particularly by those persons affected, gained through an educational and cooperative program could aid in solving many enforcement problems and achieving the ultimate success of the law's intent. The state of Michigan might give consideration for the passage of a similar law to protect lake and stream shorelands which are not largely developed in that state.

Air Pollution. Some areas in the basin, including state forest lands and areas adjacent to routes traveled by recreationists, are being adversely affected by unpleasant odors associated with their general location. Industrial concerns are responsible for problems in Midland, Alma, and Harbor Beach. Scattered throughout the northern half of Zone 2 and the western half of Zone 3 are many oil fields supporting a large number of oil wells. In 1967 there were approximately 4,500 oil wells in the Lake Huron Basin -- 2,000 of these were active producers of oil (19). Oil wells found at several locations in the northern portion of Zone 2 are sources of nauseous hydrogen sulfide gases. If improperly capped or sealed, these gases escape to the atmosphere and can reduce the quality of any recreation experience.

The oil and gas producing industry, through the American Petroleum Institute, is currently undertaking research on the problems of odors associated with oil and gas wells.

Problems Confronting Private Recreation Enterprises. Commercial recreation establishments are faced with a variety of obstacles ranging from inadequate financial credit to the operators' lack of professional knowledge. Recreation businesses are generally considered poor risks by financial institutions. Without credit the modernizing and expansion of facilities so necessary to the success of any business venture is almost impossible. Assistance given by the Small Business Administration, the Farmers Home Administration, and the Economic Development Administration is partially alleviating crucial credit shortages. These three agencies are the principal sources of loans for outdoor recreation purposes. However, the monies available through the SBA have been substantially curtailed, while the latter two agencies provide loans which are available only to particular types of enterprises. In addition, there is a variety of other federal assistance in outdoor recreation in the form of credit, technical aid, educational services, and research from a considerable number of other federal agencies. Many of these programs are little known and even less understood by would-be recipients. There is a need for an informative promotional program to make those needing such services more clearly aware of their existence and applicability.

The vulnerability of commercial recreation facility owners to liability suits necessitates the purchase of costly liability insurance. A recent law adopted by the state of Michigan protects landowners against liability suits unless extreme negligence can be proven. This law is designed to open more private lands for public use, primarily hunting, but it does not apply to commercial recreation establishments charging user fees.

An increasing number of persons having access to idle land (e.g., farmers, ranchers, retirees, and others) are undertaking the development and management of outdoor recreation enterprises. Many of these people lack the necessary land resources, skill and knowledge of effective park layout, administrative techniques, and the ability to deal properly with the public, which are requisites for the establishment and operation of a successful enterprise. There are exceptions in which such knowledge is not a necessity -- small primitive camping areas and game farms could be operated without the need for specialized training. Conversely, the management of a recreation area providing modern campgrounds, hiking trails, boating facilities, a swimming beach, and concession stand requires special knowledge and ability.

A recent publication of the Bureau of Outdoor Recreation, "Financing of Private Outdoor Recreation" , indicates the consequence of this lack of knowledge and ability. Financial institutions in responding to various questions indicated that, aside from the seasonal aspects of recreation enterprises, the inexperience of managers was the primary reason for their regarding such enterprises as more risky than the average business (53). To provide further incentive for persons to undertake such enterprises and successfully operate them, increased governmental assistance in the form of technical advice and government sponsored short courses at state universities on fundamental park management practices might be considered.

There are many private recreation area operators who are providing only average quality facilities and are not giving adequate consideration to enhancing the environmental aspects of their establishments. Appropriate training and well publicized technical assistance programs should promote the establishment of higher quality facilities in addition to an improvement of the esthetic environment at private recreation areas.

The need for a closer working relationship and better understanding between public outdoor recreation managing agencies and the private outdoor recreation sector is an area worthy of greater attention. The private sector has, in some instances, duplicated existing public facilities in the same area. The establishment of government facilities in areas that were already served by commercial operators has also occurred. While such happenstance has not yet resulted in serious consequences, the likelihood of its doing so in the future will increase. Growing demands for public recreation facilities and a lack of sound business judgement on the part of private operators has caused many of the present conflicts. Better planning and coordination of future facility developments between public managing agencies and the private sector could greatly alleviate this problem. If prospective private recreation operators had access to information regarding the location and types of planned facility developments of public agencies, it would prove advantageous both to them and to the public managing agencies. With access to such information the private operator could eliminate consideration for development in those areas in which competition might develop or give consideration to providing a different type of facility to either complement or supplement the planned public facilities. State Outdoor recreation plans should give consideration to areas where private development would be appropriate.

A major reason for the private recreation industries' inability to keep abreast of demands has already been mentioned: finances. Another possible restraint is the public's reluctance to pay directly for outdoor recreation. Access to and use of the outdoors is considered an inalienable right of every American. The public often does not realize that mushrooming costs, especially for increasingly specialized facilities, are placing heavy burdens on public as well as private resources and finances alike.

Limitation of International Boundary. Since this report considers only the United States' portion of the Lake Huron Basin, the relationship to the Canadian portion of the basin was not explored. A substantial number of Canadian tourists use United States recreation facilities and vice versa. Indications are that the international boundary is not a physical limitation to tourists' using natural resources common to the two countries. The existence of the political boundary, however, tends to handicap natural resource planning efforts. A similar study for the Canadian portion of the basin could complement this study and give a complete overview of water-oriented outdoor recreation in the Lake Huron Basin.

ACTION PROGRAMS

Federal, state, and local governments have fostered significant legislation and programs designed with the intent both to correct the wanton depredation of valuable natural resources and provide through these resources an environment capable of supporting the recreational opportunities demanded by the public. The effects of some of these programs have been discussed in previous chapters. A summary of the more important legislation and action programs affecting the Lake Huron Basin follows:

Federal

Outdoor Recreation Programs. The Land and Water Conservation Fund Act of 1965 authorizes 50 percent matching grants to states and their political subdivisions for planning, acquisition, and development of outdoor recreation resources. Acquisition and development assistance is available for state and local projects which are in accord with a state's comprehensive outdoor recreation plan. This program is administered by the Bureau of Outdoor Recreation.

Anti-pollution Program. The Federal Water Pollution Control Administration is authorized to provide financial assistance to states and municipalities for the prevention, control, and abatement of water pollution through: (1) grants for construction of sewage treatment works of up to 30 percent of eligible project costs (if states provide matching funds and certain other conditions are met, the federal share may be increased to 50 percent), and (2) grants up to 75 percent of the total cost of facilities that will demonstrate new or improved methods of controlling discharge of waste from storm sewers or combined storm and sanitary sewers. To qualify, such projects must be approved by the appropriate state water pollution control agency.

On November 3, 1966, the Clean Water Restoration Act was enacted. This act provides grants to states for developing a comprehensive pollution control and abatement plan for a basin. Also, certain portions of the Federal Water Pollution Control Act of 1965 were amended which pertained to construction grants to municipalities for sewage treatment plants. Two studies will be made under the provisions of this act: (1) a watercraft pollution study and (2) a study of incentive assistance to industries.

Fish and Wildlife Programs. The Dingell-Johnson Act provides for assistance to states in developing sports fishing resources with funds derived from a 10 percent manufacturer's excise tax on fishing equipment. The federal funds allocated from this program are matched by 25 percent state funds.

Under the Pitman-Robertson Act, states receive grants for improving and restoring wildlife habitat. The revenue for these grants is derived from the proceeds of an 11 percent manufacturer's excise tax on sporting arms and ammunition. These funds also are matched by 25 percent funds from the state. These programs are administered by the Department of the Interior's Bureau of Sport Fisheries and Wildlife.

Water Resource Development Program. The Federal Water Projects Recreation Act of 1965 (Public Law 89-72) establishes congressional policy that full consideration shall be given to recreation and fish and wildlife enhancement as purposes of federal water resource projects; encourages non-federal agencies, states, cities, counties, districts, or any combination thereof, to assume responsibility for the operation and maintenance of that part of each project utilized for recreation, fish and wildlife purposes; and permits entrance fees, and other charges to be levied to offset expenditures thus incurred. It requires that non-federal agencies pay one-half of the original costs of land acquisition and recreation facility construction, including modifications. It also permits construction of needed recreation facilities at existing reclamation projects.

Agricultural Programs. Under the provisions of Public Law 566, the Watershed Protection and Flood Prevention (Small Watershed) Act of 1954, as amended by the Food and Agriculture Act of 1962, the Department of Agriculture may share with state and local agencies up to half the cost of land, easements, and right-of-way for reservoirs and other areas to be managed by state and local sponsors for public recreation. A small watershed must be less than 250,000 acres.

Under Section 101 of the Food and Agriculture Act of 1962, the Department of Agriculture can enter into long-term agreements with farmers to convert land regularly used for crop production into recreation projects. Title IV of the Agricultural Act of 1962 permits the Farmers Home Administration to make loans to individual farmers for development of income-producing outdoor recreation enterprises. The FHA may also make loans to nonprofit associations up to $500,000 and insure loans up to $1 million for effecting changes in land use, including the development of recreation facilities.

Under Title VI of the Food and Agriculture Act of 1965, the Department of Agriculture can enter into long-term agreements with farmers to convert land regularly used for crop production to practices or uses that will conserve soil, water, and/or forest resources; to establish, protect, and/or conserve open spaces, natural beauty, wildlife habitat, and recreational resources; and/or to prevent air and water pollution. The Department of Agriculture is also authorized to make grants to all levels of government for the acquisition of cropland to preserve open spaces and natural beauty, to develop wildlife habitat and recreational facilities, and to prevent air and water pollution. The Department of Agriculture also cost shares with farmers to control sedimentation of streams, lakes, and ponds, and to improve wildlife habitat.

Open Space Programs. Title VII of the Housing Act of 1961 as amended by Title IX of the Housing and Urban Development Act of 1965 authorizes grants up to 50 percent of total costs to states and local public agencies for the acquisition and development of open space lands for park, recreation, conservation, scenic, or historic purposes in urban and suburban areas. Land to be acquired must be undeveloped or predominantly undeveloped. Title IX of the same act also authorizes grants to states up to 50 percent of the cost for acquiring developed lands and clearing them for open space purposes if available undeveloped lands are inadequate to meet the needs in built-up sections of cities.

Urban Beautification and Improvement Programs. Under Title IX of the Housing and Urban Development Act of 1965, grants may be made to states and local public bodies to assist in carrying out local programs of urban beautification and improvements. Grants may not exceed 50 percent of the cost of activities in excess of the normal expenditures for comparable activities. Also under Title IX, a maximum of $50 million of the funds is authorized for grants covering up to 90 percent of the costs of projects having special value in developing or in demonstrating new improved methods and materials for urban beautification and improvement.

State. The Water Resources Commission of the Michigan Department of Natural Resources in compliance with the Federal Water Quality Act of 1965 has developed and submitted for approval water quality standards for all interstate waters bordered by the state. On the state's own initiative standards have been approved with certain reservations. The Great Lakes Fisheries Commission is engaged in a lamprey eradication program which will facilitate the establishment of anadromous fish species in Lake Huron. The various concerned agencies within the Department of Conservation have prepared a ten-year report for the purpose of publicizing and gaining support for their anticipated funding requirements. Some major action programs outlined in Michigan's Outdoor Future are listed below:

1. The expenditure of $150 million in ten years for acquisition and development of state park lands.

2. Attention given to the acquisition of state historical sites.

3. Additional development of Mackinac Island.

4. Approximately $49 million devoted to improvement of the state's fisheries.

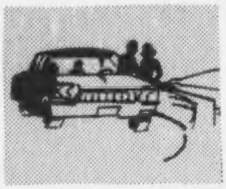
5. State forest development, including campgrounds, roads, access, and trails, totaling over $7 million.

6. Over $26 million is requested for the acquisition of game land with emphasis placed on purchases in the southern region of the state.

7. Water access sites, marinas, harbors, and other boating facilities have received special attention because of increased interest in water-oriented activities. Funding in the next ten years to carry out proposed projects will exceed $112 million.

As a result of voter approval in November 1968, the state of Michigan will undertake a conservation bonding program which will provide a total of $435 million-$335 million for water pollution control and $100 million for recreation. The $100 million for recreation will supplement the capital outlay being provided by the regular ten-year outdoor recreation program. The goal of Michigan's water pollution program is control of pollution by 1980. This will require 210 new sewage treatment plants, improvements to 126 existing plants, and sewers for 8 1/2 million people. Plants will cost $568 million and sewers and storm water control facilities another $641 million. Much of the cost will be borne by the federal government and local units of government. The $100 million recreation bond issue will help finance fish and game programs, forest recreation, and state park development and help fund recreation programs for local units of government. Of the $100 million, $30 million will go to local units of government for purchase of recreation lands and the development of leisure time facilities.

In addition to this bonding program, many industries are being required to upgrade their treatment systems to meet the interstate and intrastate standards that have been established by the state in cooperation with the federal government.



Chapter 8
Conclusions

Consideration having been given to all elements affecting water-oriented outdoor recreation in the Lake Huron Basin, the following conclusions are offered:

1. The current annual recreation demand in the Lake Huron Basin is approximately 22 million recreation days. By the year 2000 this amount will more than triple, and by 2020 nearly a fivefold increase is anticipated. More than 30 percent of the present demand can be attributed to vacation use.

2. More than 2.1 million acres of land (primarily forest land) and water resources have potential for many varieties and degrees of recreation development with reasonable access from centers of population.

3. In 1964 there were nearly 14,000 acres of developed land available for recreation to the general public at 423 areas in the basin. Seventy-nine percent of these areas provided facilities for water-dependent activities. Despite this, there was a deficit of 17,000 acres of available developed recreation lands for public use.

4. There is a need for additional developed recreation acreage in the southern half of the basin (Zones 2 and 3). Whereas the recreation lands in the northern area (Zone 1) are generally more than adequate to meet the needs of its residents, people in the southern zones and outside the basin will continue to rely on the recreation opportunities of the northern area -- primarily for weekend camping and sightseeing. This influx of people is placing additional demands on these facilities.

5. Competition for the use of recreation lands and waters has developed among the various recreation activities. Because of increased participation in the common activities (e.g., hiking, swimming, boating) and the advent of new activities (e.g., snowmobiling and trail motorcycling) conflicts in use are occurring more frequently than in the past.

6. Seasonal and vacation homes contribute substantially to utilization of recreational opportunities offered by the land and water resources. The extent of their development on many lakes and streams, however, reduces opportunity for public projects; and public access to water is a distinct problem in some areas. In addition, considerable acreage of private land formerly accessible to hunters is being fenced off from the public, much of it through the formation of private hunting clubs.

7. During urban development adequate consideration has not been given to preserving land and water resources for recreation. This has resulted in additional needs for open space and day-use recreation facilities at Flint, Saginaw, Midland, Bay City, and other cities in the basin.

8. A large segment of the public demand special recreation facilities or more elaborate facilities than are usually provided by public agencies. Private enterprise has sometimes responded with profitable, quality facilities; however, in many cases the result has been the establishment of enterprises with low returns on investments, mediocre to poor quality facilities, and environmental deterioration. Some form of public assistance appears to be desirable to encourage private involvement where demands would permit profitable recreation development. There is a need to expand existing public technical assistance programs for all phases of design, management, and administration of private facilities.

9. Effluents from municipal and industrial waste treatment plants have contaminated portions of Lake Huron and its tributaries. Recreational use of these waters has been substantially reduced in these areas.

10. Lack of adequate disposal systems servicing permanent waterfront homes, vacation residences, and resorts are contributing to the accelerated eutrophication of several small lakes and the general degradation of basin waters. The formation of various private groups to promote pollution abatement are serving as examples of what can be accomplished in alleviating this problem.

11. Although water pollution controls have been operating in the past and stronger programs are in the initial stages, tangible evidence of pollutants on recreational waters is still apparent. A good legal base to alleviate water pollution has been established through the enactment of federal and state pollution abatement laws and regulations, including the establishment of interstate and intrastate water quality standards. The state of Michigan is currently encouraging pollution abatement by

ordering an upgrading of existing waste treatment facilities of municipalities and industries. In addition the people of Michigan recently approved the financing of a $335 million water pollution control bonding issue to augment existing funds and programs.

12. Air pollution is an environmental problem affecting the quality of recreation opportunities in the basin. Malodorous natural gas vapors associated with active oil wells are present at several locations throughout a portion of the basin. The American Petroleum Institute, representing the oil and gas producing industry, is currently undertaking research to determine the feasibility of eliminating or minimizing natural gas odors. Industrial complexes are also responsible for atmospheric contamination in certain areas.

13. Highway and building construction and runoff from farms are major sources of local stream and lake sedimentation in the Lake Huron watershed.

14. Excessive algae and other undesirable plant growth are present in basin waters (lakes and streams) throughout much of Zone 2 and the southern and eastern portion of Zone 3. Nutrients which are reaching and enriching basin waters come from various sources such as sewage effluent from municipalities and industry, fertilizer and animal waste runoff from intensively farmed agricultural lands, household detergents, and lawn fertilizers. The resulting algal blooms and the accelerated growth of undesirable aquatic vegetation is impairing the quality of the basin environment in these areas. Recreation activity is also being affected at a number of public recreation areas because of such vegetative growth.

Chapter 9
Recommendations

In considering the basin's needs for outdoor recreation opportunities and the extent to which these needs may be met, it is recommended that:

1. Consideration be given by federal, state, and local planning and land managing agencies to the needs for public recreation lands and facilities, particularly in the metropolitan areas, as well as public access to the streams, lakes, and shoreline of the basin.

2. Private development and administration of recreation facilities be encouraged. As an aid to implementation of this recommendation:

   a. The recreation plans of local, state, and federal agencies should consider where private development would be appropriate, and these plans should have wide exposure to the people in the areas affected.

   b. Consideration should be given to further publicizing and greater use of existing public financial assistance to private outdoor recreation interests.

   c. Existing government technical assistance programs should be futher publicized and expanded for all phases of the design, management, and administration of private development.

   d. Consideration should be given by the state of Michigan to the incorporation in its college curriculum of educational short courses for recreation operators, covering design, administration, and management practices.

3. Federal, state, and local agencies managing lands and water for recreation in the basin adopt regulations governing the use of recreation vehicles (e.g., snowmobiles, motorcycles, aircraft, boats) to the end that adequate provisions are made for such uses; environmental deterioration is avoided; and conflicts among these and all other legitimate recreation pursuits are minimized.

4. The state of Michigan consider the enactment of legislation similar to The shoreland Management Program adopted by the state of Wisconsin. Such legislation would have as its express intent the enhancement of flood plain and shoreline values for the purposes of maintaining natural beauty and enhancing outdoor recreational use for the public.

5. Rigorous enforcement of pollution laws be undertaken by all levels of government. Industries and municipalities should be encouraged to meet or better the present deadlines for pollution controls as set forth in the state and federal water quality standards.

6. Continued research and experimentation be carried out by the Federal Water Pollution Control Administration to:

   a. Develop an economical central sewage treatment system which could service seasonal and waterfront residential complexes.

   b. Develop an economical method for further nutrient removal from treated waste water.

7. The oil and gas producing industry publicize the findings of studies on curbing natural gas odors. Follow-up action should then be taken by the industry and the state to institute any reasonable measures identified which would limit noxious gas odors.

8. The property owners and/or communities located on the shores of lakes and streams be encouraged to organize action associations for the purpose of controlling water pollution and other environmental problems. The programs of these citizens' groups should be publicized to further encourage their efforts, acquaint others with the urgent need to plan wisely for all uses of the shoreline resources, and to demonstrate to others that strong citizen action can be successful in curbing pollution.

9. Watershed management and soil conservation practices be intensified and extended as a means of reducing soil erosion and siltation, thereby increasing the recreation potential of the basin's water resources.

10. Existing laws and regulations governing the control of erosion and siltation due to highway, industrial, and municipal construction be rigorously enforced; and that the state of Michigan encourage municipalities to adopt ordinances for

this purpose where they are lacking. Consideration might be given to broadening the scope of the Subdivision Control Act of 1967 (Act No. 288, Public Acts of 1967, approved August 11, 1967) to specifically cover erosion and other environmental problem areas.

11. United States studies and programs aimed at better understanding and improvements of the water quality and recreation potential of the Lake Huron Basin take into consideration and be coordinated with parallel studies and programs of Canada and particularly the Province of Ontario.

Appendix A

Supply Data

Table A-1

SUPPLY SUMMARY
Lake Huron Basin

	No. Areas	No. Water Dependent	Total Land and Water Acreage	Percent of Total Acreage
Zone 1				
Federal	12*	9	552,779	31
State	70	67	1,202,695	68
Local	38	18	894	**
Private	69	57	1,921	1
Zone 1 Totals	189	151	1,756,368	82***
Zone 2				
Federal	1	1	3,400	3
State	34	32	126,024	94
Local	25	13	1,350	1
Private	70	53	2,301	2
Zone 2 Totals	130	99	133,075	6***
Zone 3				
Federal	3*	3	60,000	23
State	22	20	201,773	75
Local	28	22	1,071	1
Private	51	40	1,239	1
Zone 3 Totals	104	85	264,083	12***
Basin				
Federal	16	13	616,179	28
State	126	119	1,530,492	71
Local	90	53	3,315	**
Private	190	150	5,461	1
Basin Totals	423	335	2,155,447	100

* Each developed recreation site on the Hiawatha and Huron National Forests is considered a separate area; however, total acreages are for the entire forest holdings in the basin.

** Less than one-half percent.

*** Percent of Basin Total.

Source: (Appendix C, Tables A-2 and A-3.)

Table A-2

PRIVATE GROUP CAMPS

Zone	No. of Group Camps	Developed Acreage*	Approximate Total Capacity (persons)	No. with Water-Dependent Activities
1	35	823	2,940	31
2	50	1,802	6,435	45
3	36	1,068	3,814	32
Basin	121	3,693	13,189	108

* Note: Since acreage figures were not always available in the computation phase, it was assumed that the size of an average area (in acres) is 40 percent of the capacity for all group camps. This percentage value was derived from a sample of several group camps in which the acreages and capacities were known.

Sources: (1,22)

Table A-3

PRIVATE CAMPGROUNDS

Zone	No. of Campgrounds	Developed Acreage	Approximate Total Capacity (sites)	No. with Water-Dependent Activities
1	34	1,098	1,213	26
2	20	499	762	8
3	15	171	329	8
Basin	69	1,768	2,304	42

Sources: (4,5,6,39)

Table A-4

SKI FACILITIES

	Slopes	Tows	Lifts	Trails	
Nubs Nob	12	5	3	no	
Walloon Hills	9	3	2	yes	
Pinnacles Ski Resort	na*	na	1	yes	
Sylvan Knob	18	7	3	no	
Otsego Ski Club**	11	4	4	no	
New Au Sable Lodge	na	na	na	no	
Sheridan Valley	8	3	1	no	
Fonro Ski Resort	5	3	0	no	
Mt. Maria	5	2	1	no	
Mio Mountain	11	4	0	no	
Grayling Winter Sports Area	20	12	1	no	
Skyline	9	8	1	no	
Indian Hills Ski Park	na	na	0	yes	
Ogemaw Hills	6	2	1	no	
Snow Snake Mountain	10	5	0	yes	
Mott Mountain	12	6	0	no	
Apple Mountain	7	8	0	no	
Paradise Valley	na	na	0	no	
Mt. Holly	na	10	3	no	
Mt. Christie	8	6	2	no	
Mt. Frederick	15	5	3	yes	
Total	166+	93+	26+	6 Yes	15 No

* na = not available
** Private

Source: (27)

Zone Totals

	I	II	III
Areas	2	12	4
Acres	520	4034	855

Source: (21)

Table A-5

PRIVATE SHOOTING PRESERVES

County	Number	Acres
Alpena	1	80
Arenac	1	320
Bay	2	215
Clare	1	120
Crawford	1	280
Genesee	1	341
Iosco	1	320
Lapeer	4	2,000
Midland	1	178
Oakland	2	800
Sanilac	1	320
Shiawassee	1	275
Livingston	1	160
Total	18	5,409

Source: (21)

ZONE TOTALS

	I	II	III
Areas	2	12	4
Acres	520	4,034	855

Table A-6

SEASONAL HOMES IN LAKE HURON BASIN

County	Seasonal Homes
Alcona	1,860
Alpena	1,180
Arenac	1,100
Bay	800
Charlevoix	300
Cheboygan	2,800
Chippewa	1,300
Clare	2,000
Crawford	500
Emmet	500
Genesee	700
Gladwin	1,400
Gratiot	200
Huron	2,340
Iosco	3,230
Isabella	550
Lapeer	900
Mackinac	1,400
Mecosta	500
Midland	345
Montmorency	2,950
Oakland	2,000
Ogemaw	2,570
Oscoda	1,050
Otsego	1,800
Presque Isle	1,670
Roscommon	1,200
Saginaw	300
St. Clair	1,000
Sanilac	3,000
Shiawassee	150
Tuscola	880
Livingston	1,700
Montcalm	100
Total	44,275
Zone I	19,840
Zone II	13,875
Zone III	10,560

Source : (21)

Table A-7

POTENTIAL AND PROPOSED RECREATION LAND ACQUISITION

County	Recreation Area	Acreage
Alpena	Alpena State Forest	5
Alpena-Alcona	n.a.	1,432
Bay	War Memorial Park	45
Bay	Bigelow Park	15
Bay	Bay City State Park	24
Bay	Pinconning	75
Cheboygan	Cheboygan	190
Chippewa	n.a.	900
Crawford	Hartwick Pines	200
Crawford	Au Sable State Forest	575
Genesee	Mott Recreation Area	3,700
Gladwin	Ogemaw State Forest	600
Gratiot-Saginaw	State Game Area	11,840
Huron	Port Crescent	80
Huron	Port Crescent	200
Huron	State Game Area	4,360
Huron	Oak Beach	200
Lapeer	n.a.	2,000
Lapeer	n.a.	80
Mackinac	Straites State Park	250
Mackinac	Detour	10
Mecosta	n.a.	500
Montmorency	Clear Lake Forest Campground	1,300
Oakland	Holly Recreation Area	700
Oscoda	Oscoda County Park	68
Oscoda	n.a.	2,400
Otsego	Pigeon River State Forest	1,400
Otsego	Pigeon River State Forest	2,500
Otsego	Otsego County Park	4
Saginaw	Rust Park	30
Saginaw	Wickes Park	20
Shiawassee	n.a.	1,500

Sources: (20,57)

Table A-8

TRAILS BY COUNTY

County	Hiking & Skiing areas	Hiking & Skiing miles	Automobile areas	Automobile miles	Horseback areas	Horseback miles	Total areas	Total miles*
Alcona	0	0	1	73	1	12	2	85
Alpena	1	1	1	49	0	0	2	50
Arenac	0	0	1	72	0	0	1	72
Bay	0	0	1	32	0	0	1	32
Charlevoix	0	0	0	0	0	0	0	0
Cheboygan	3	12	1	73	2	73	6	158
Chippewa	2	7	1	50	0	0	3	57
Clare	0	0	1	43	0	0	1	43
Crawford	0	0	0	0	0	0	0	0
Emmet	1	1	1	42	0	0	2	43
Genesee	0	0	2	45	0	0	2	45
Gladwin	0	0	1	24	1	29	2	53
Gratiot	0	0	1	22	0	0	1	22
Huron	3	2	1	96	2	8	6	106
Iosco	1	1	2	66	1	27	4	94
Isabella	0	0	1	25	0	0	1	25
Lapeer	1	1	1	18	1	5	3	24
Mackinac	1	3	1	20	0	0	2	23
Mecosta	0	0	0	0	0	0	0	0
Midland	0	0	1	41	1	30	2	71
Montmorency	0	0	4	116	0	0	4	116
Oakland	5	45	1	54	3	5	9	104
Ogemaw	1	1	5	110	0	0	6	111
Oscoda	0	0	2	40	1	29	3	69
Otsego	2	4	1	31	2	65	5	100
Presque Isle	2	2	1	88	0	0	3	90
Roscommon	1	3	1	40	1	14	3	57
Saginaw	0	0	2	59	0	0	2	59
St. Clair	0	0	0	0	0	0	0	0
Sanilac	0	0	2	94	0	0	2	94
Shiawassee	0	0	1	15	0	0	1	15
Tuscola	0	0	2	69	0	0	2	69
Livingston	2	3	1	35	1	3	4	41
Montcalm	0	0	0	0	0	0	0	0
Totals	26	86	42	1,542	17	300	85	1,928

* non-automobile 386

Source: (21)

Table A-9

TRIBUTARY STREAMS IN LAKE HURON BASIN

County	Miles of Stream in Basin
Alcona	362
Alpena	301
Arenac	156
Bay	50
Charlevoix	7
Cheboygan	400
Chippewa	250
Clare	194
Crawford	188
Emmet	65
Genesee	355
Gladwin	473
Gratiot	149
Huron	942
Iosco	259
Isabella	330
Lapeer	427
Mackinac	129
Mecosta	59
Midland	309
Montmorency	306
Oakland	97
Ogemaw	381
Oscoda	219
Otsego	200
Presque Isle	301
Roscommon	107
Saginaw	593
St. Clair	8
Sanilac	571
Shiawassee	189
Tuscola	184
Livingston	169
Montcalm	58
Total	8,788

Source: (8)

Table A-10

INLAND LAKES-COUNTIES ACREAGE IN BASIN

Acreage of Water

County	Basin Acreage
Alcona	13,029.7
Alpena	13,372.9
Arenac	325.8
Bay	434.5
Charlevoix	2,000.0
Cheboygan	50,357.6
Chippewa	6,000.0
Clare	2,500.0
Crawford	2,000.0
Emmet	6,500.0
Genesee	5,135.8
Gladwin	7,294.4
Gratiot	550.0
Huron	242.6
Iosco	10,993.6
Isabella	1,343.6
Lapeer	4,000.0
Mackinac	7,000.0
Mecosta	6,000.0
Midland	2,544.7
Montmorency	12,100.1
Oakland	5,000.0
Ogemaw	6,135.6
Oscoda	3,840.2
Otsego	7,000.0
Presque Isle	15,504.3
Roscommon	8,000.0
Saginaw	1,479.5
St. Clair	50.0
Sanilac	75.0
Shiawassee	400.0
Tuscola	1,789.6
Livingston	4,000.0
Montcalm	1,000.0
Total	208,008.5

Zone Acreage
Zone 1 = 146,704
Zone 2 = 42,947
Zone 3 = 18,357

Source: (26)

Appendix B

Methodology

MARKET AREA DEMAND FLOWCHART

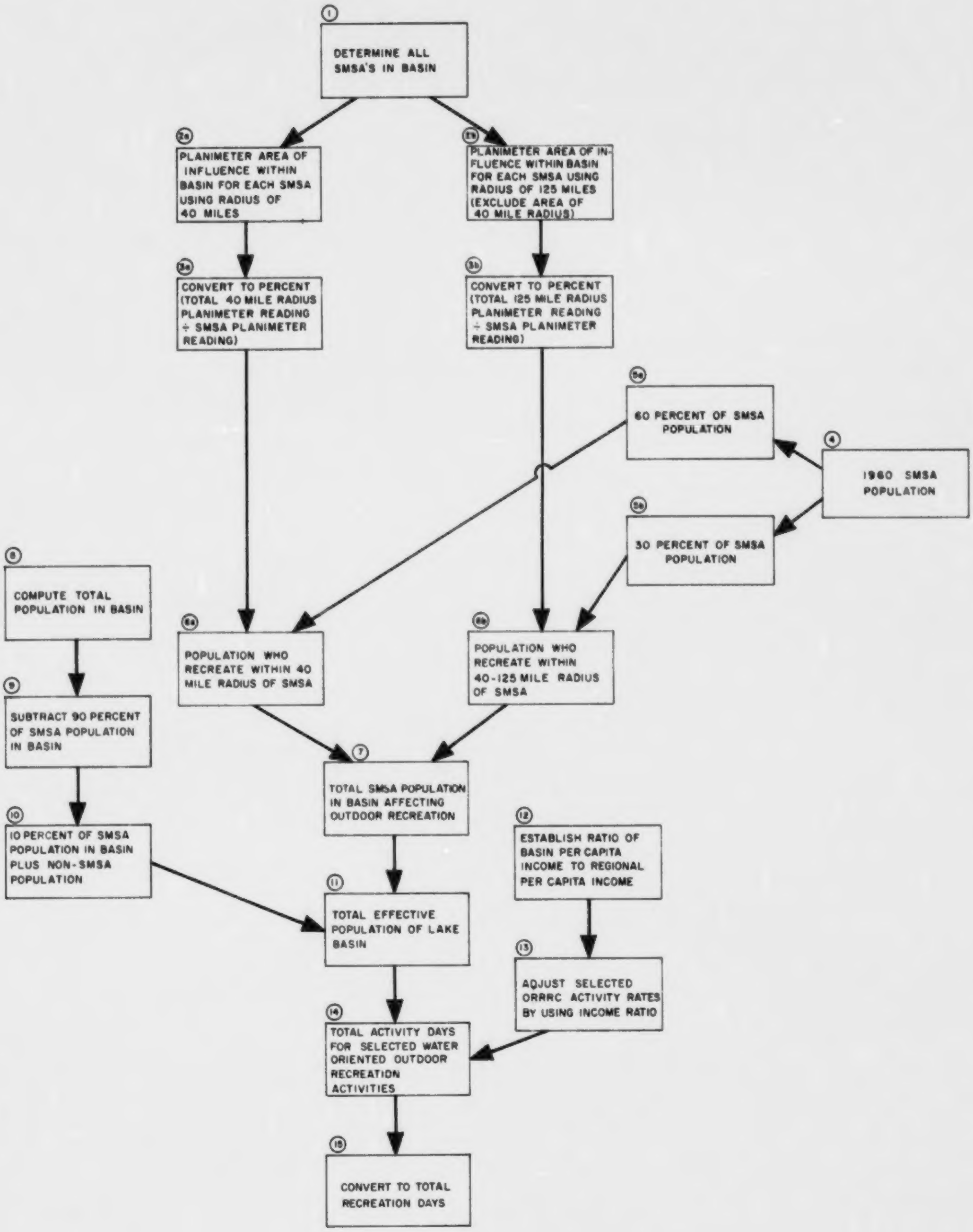

①
DETERMINE ALL SMSA'S IN BASIN
②a
PLANIMETER AREA OF INFLUENCE WITHIN BASIN FOR EACH SMSA USING RADIUS OF 40 MILES
②b
PLANIMETER AREA OF INFLUENCE WITHIN BASIN FOR EACH SMSA USING RADIUS OF 125 MILES (EXCLUDE AREA OF 40 MILE RADIUS)
③a
CONVERT TO PERCENT (TOTAL 40 MILE RADIUS PLANIMETER READING ÷ SMSA PLANIMETER READING)
③b
CONVERT TO PERCENT (TOTAL 125 MILE RADIUS PLANIMETER READING ÷ SMSA PLANIMETER READING)
⑤a
60 PERCENT OF SMSA POPULATION
④
1960 SMSA POPULATION
⑤b
30 PERCENT OF SMSA POPULATION
⑧
COMPUTE TOTAL POPULATION IN BASIN
⑥a
POPULATION WHO RECREATE WITHIN 40 MILE RADIUS OF SMSA
⑥b
POPULATION WHO RECREATE WITHIN 40-125 MILE RADIUS OF SMSA
⑨
SUBTRACT 90 PERCENT OF SMSA POPULATION IN BASIN
⑦
TOTAL SMSA POPULATION IN BASIN AFFECTING OUTDOOR RECREATION
⑩
10 PERCENT OF SMSA POPULATION IN BASIN PLUS NON-SMSA POPULATION
⑫
ESTABLISH RATIO OF BASIN PER CAPITA INCOME TO REGIONAL PER CAPITA INCOME
⑪
TOTAL EFFECTIVE POPULATION OF LAKE BASIN
⑬
ADJUST SELECTED ORRRC ACTIVITY RATES BY USING INCOME RATIO
⑭
TOTAL ACTIVITY DAYS FOR SELECTED WATER ORIENTED OUTDOOR RECREATION ACTIVITIES
⑮
CONVERT TO TOTAL RECREATION DAYS

PLATE B-1

METHODOLOGY FOR ESTIMATING DEMAND FOR RECREATIONAL OPPORTUNITIES IN THE LAKE HURON BASIN

Market Area Demand. The first step in determining the present recreation demand for the modified market area involved calculation of the population on which to base estimates. The 1960 population of all SMSA's inside the basin, as well as those within 125 miles of the basin was determined.

From information contained in the "California Public Outdoor Recreation Plan" (9), ORRRC Report No. 4 (35), and the "Report on the Comprehensive Survey of the Water Resources of the Delaware River Basin" (63), it was concluded that:

a. Sixty percent of all recreation activity occurs within 40 miles of the participant's home.

b. Another thirty percent occurs between 40 and 125 miles of the participant's home.

c. Ten percent of all use occurs at distances greater than 15 miles.

It was assumed that 60 percent of the recreation activity generated by the SMSA population should be satisfied within a 40-mile radius of the SMSA. This participation constituted the "day-use" sector. Likewise, 30 percent of the recreation activity generated by the SMSA population would be satisfied between the 40 and 125-mile radii of the SMSA. This group of participants is termed "overnight or weekend" sector. Reference is made to the flow chart on the opposite page which shows the sequential steps in deriving the modified market area demand for the day and weekend sectors. Results of this procedure are tabulated in Table B-1.

Vacation Demand. The following procedure yields an estimate of the number of people who spend their vacations in the basin. Source material for this procedure is taken from "Tourist Travel in Michigan" (24).

Step 1. In 1964 an estimated 22,600,000 tourists used Michigan highways. Resident and nonresident tourists were found by multiplying this figure times 27 percent and 73 percent, respectively. Result: 6,102,000 resident tourists and 16,498,000 nonresident tourists.

Step 2. To obtain the number of tourists who spent 3 or more nights in the state, the resultant figures above were multiplied by 67 percent and 55 percent. Result: 4,088,340 resident tourists and 9,073,900 nonresident tourists.

Step 3. To acquire an estimate of tourists who spend 3 or more nights in the state, the figures in Step 2 are added: 4,088,340 + 9,073,900 = 13,162,240 tourists.

Step 4. The value above is multiplied by 50 percent which represents the proportion of tourists traveling with outdoor recreation as a main prupose in making a trip: 13,162,240 x 50 percent = 6,581,120 tourists.

Step 5. To allocate to the Lake Huron Basin a portion of the value derived in the preceding step, a comparison of state park camping permits issued at the basin's 19 state parks to the total number for all state parks yields 27.3 percent. Therefore 6,581,120 x 27.3 percent = 1,796,646 tourists or vacationists.

Step 6. Thus to obtain the number of recreation days in the basin, multiply the number of tourists in Step 5 by 4.9 which is the average number of days a vacationist spends in Michigan. Result: 1,796,646 x 4.9 = 8,803,565 recreation days. This value is used in Table B-2 to compute the present vacation demand for selected activities in the Lake Huron Basin.

Future Demand. Table B-3 on page B-7 shows future estimated participation in selected summer activities.

Zone Demands. In order to determine the recreation demand for each of the three zones, it was necessary to compute the resident demand and the vacation demand separately. For the resident demand, the total annual participation rate for the basin (Table B-1) was adjusted by an income index computed for each of the three subbasins. This income index is a zone-basin ratio of per capita income. Zone population estimates were multiplied by the adjusted annual participation rates for each of the zones to yield activity occasions. Since the resident basin demand figure was previously determined, each zone total is expressed as a percent of the total basin.

Distribution of seasonal vacation homes and attendance at state parks were used as indicators to gauge the zonal allocation for the vacation demand. Both of these factors were given equal weight in obtaining the percent of predetermined vacation activity occasions found in Table B-2 of this Appendix.

Table B-1

DEMAND FOR SELECTED WATER-ORIENTED OUTDOOR RECREATIONAL ACTIVITIES
LAKE HURON BASIN, 1960
(Day and Overnight or Weekend Sectors)

Activity	Adjusted Annual Participation Rate	Adjusted Summer Participation Rate	Annual Activity Occasions (thousands)	Summer Activity Occasions (thousands)
Water-dependent				
Swimming	4.81	4.17	6,883	5,967
Fishing	3.61	1.85	4,800*	2,448*
Boating	1.99	1.33	2,848	1,903
Water-Skiing	.24	.19	343	271
Canoeing	.12	.06	167	90
Sailing	.06	.04	90	64
Subtotal	10.83	7.64	15,131	10,743
Water-enhanced				
Camping	.59	.36	844	515
Picnicking	3.28	2.10	4,693	3,004
Sightseeing	5.98	2.44	8,556	3,491
Nature Walks	2.18	.54	3,119	773
Hunting	1.61	.14	1,500	134*
Hiking	.32	.19	458	272
Subtotal	13.96	5.77	19,170	8,189
Winter Sports				
Ice Skating	.89	--	1,273	--
Sledding	.41	--	586	--
Snow Skiing	.06	--	90	--
Subtotal	1.36	--	1,949	--
TOTAL	26.15	13.41	36,250	18,932

*Based on information obtained from Bureau of Sport Fisheries and Wildlife

Table B-2

DEMAND FOR SELECTED WATER-ORIENTED OUTDOOR RECREATIONAL ACTIVITIES LAKE HURON BASIN, 1960 (Vacation Sector)

Activity	Percent who engaged in outdoor activities on vacation trips	Column 2 x 8,803,565* (activity occasions)
(a) Sightseeing	53	4,665,889
(b) Swimming	38	3,345,355
(c) Fishing	27	2,376,963
(d) Picnicking	29	2,553,034
(e) Boating and Canoeing	19	1,672,677
(f) Hiking	14	1,232,499
(g) Camping	10	880,356
(h) Hunting	4	352,143
(i) Nature Walks	6	582,214
(j) Horseback Riding	3	264,107
(k) Skiing and Winter Sports	1	88,036
(l) Took trip but did not engage in outdoor activities	22	1,936,784
Totals	226**	17,749,166***

* See results in Step 6.
** Totals to more than 100 because vacationists participate in more than one activity per day.
***Total does not include activities (j) and (l).

Source: ORRRC Study Report 20, Table 50, Page 50.

Note: This analysis assumes that those enjoying their vacations while in the basin participated in approximately two activities per day.

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Table B-3

EXPECTED SUMMER (JUNE, JULY, AUGUST) PARTICIPATION IN SELECTED WATER-ORIENTED ACTIVITIES 2000 AND 2020 LAKE HURON BASIN

Activity	1960 Summer Activity Occasions (1,000)[1]	2000 Summer Activity Occasions (1,000)[2] Without Opportunity	2000 Summer Activity Occasions (1,000)[2] With Opportunity	2020 Summer Activity Occasions (1,000)[3] Without Opportunity	2020 Summer Activity Occasions (1,000)[3] With Opportunity
Water-dependent					
Swimming	5,967	18,468	21,537	25,010	29,613
Fishing[4]	2,448	4,896	4,896	6,120	6,120
Boating	1,903	6,030	7,195	8,195	9,956
Water Skiing	271	1,180	1,404	1,648	1,984
Canoeing[5]	90	262	312	357	430
Sailing[5]	64	197	235	266	324
Subtotal	10,743	31,033	35,579	41,596	48,427
Water-enhanced					
Camping	515	1,845	3,027	2,532	4,305
Picnicking	3,004	6,801	8,406	8,841	11,248
Sightseeing	3,491	9,045	14,939	11,990	20,832
Nature Walks	773	1,866	1,866	2,452	2,452
Hiking	272	899	1,489	1,227	2,112
Hunting[4]	134	243	256	297	317
Subtotal	8,189	20,699	29,983	27,339	41,266
TOTAL	18,932	51,732	65,562	68,935	89,693

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[1] From Column 5, Table B-1.

[2] Projections based on data contained in Table 6, ORRRC Report 26.

[3] 2020 figures obtained by straight line equation.

[4] Based on information obtained from Bureau of Sport Fisheries and Wildlife.

[5] Assumes same projection as "Boating".

METHODOLOGY FOR ESTIMATING THE PRESENT ACREAGE DEVELOPMENT OF RECREATIONAL LANDS

The problem of adequately serving the recreational needs of the public comes into sharp focus if developed acreages are considered, rather than total public recreation land. Table B-4 provides estimates of the basin's present developed acreages by zone. In compiling data for this table, it was assumed that existing public recreation areas, except those which have been newly established, have been developed to the optimum level. From Clawson's classification of recreation lands (11), optimum development for user-oriented areas is considered to be 70 percent and that for intermediate areas is 15 percent.

Table B-4

EXISTING DEVELOPED ACREAGES
(Estimate in acres with adjustments)*

Zones	Federal	State	Local	Private	Zone Total
1	69	3,248	626	1,921	5,864
2	none	2,325	894	2,301	5,520
3	29	374	806	1,239	2,448
Basin Total	98	5,947	2,326	5,461	13,832

*Adjustments in acreages provided by sources Appendix C, Table A-4, and Table A-5 were made as follows:
(a) Federal - estimated total present development in three developed areas.
(b) State - adjusted to 15 percent level of development except for highly developed state parks (70 percent used) and boat launching sites (100 percent used).
(c) Local - adjusted to 70 percent level of development.
(d) Private - adjusted to 70 percent development at privately owned campgrounds and group camps.
Undeveloped and/or newly acquired lands were not tabulated.

METHODOLOGY FOR ESTIMATING ACREAGE NEEDS

Determining Present Resource Requirements. This method is based on land area per person standards as determined by personnel in the Lake Central Regional Office, Bureau of Outdoor Recreation. These standards were arrived at by compilation of existing information from many sources. They are not to be considered as official Bureau standards. As stated on page 5-2 of Chapter 5, the acreage needs are determined in order to support anticipated visitation on those days when maximum use occurs. This was determined as follows:

14 week summer season	98 days
28 weekend days plus 2 holidays	30 days
Weekdays	68 days

Assume three weekdays of use equals one weekend day of use. 23+30=53 capacity days. For the activity of swimming, which is curtailed by inclement weather, assume 80 percent of capacity days will be suitable. Therefore, assume 42 capacity days for swimming.

Land area per person standards as presented below include all development necessary to support one person engaging in the respective activity. The activities of swimming, fishing, boating, picnicking, and camping are considered since these constitute the more popular, basic activities that should be provided for wherever possible.

Boating

Assume:

1. 3 people/car and boat
2. 1,633 sq ft parking/car and trailer incl ramp facility
3. Turnover factor of 2

Swimming

Assume:

1. 4 people/car
2. 48 cars parking/acre (910 sq ft/car or 227 sq ft/person)
3. 75 sq ft beach/person
4. Turnover factor of 1.5

Picnicking

Assume:

1. 4 people/car
2. 10 picnic tables acre, including parking
3. Turnover factor of 1.5

Camping

Assume:

1. 5 people/party
2. 8 campsite units/acre
3. Turnover factor of 1.0

Fishing

Assume:

1. 2 people/car and boat
2. 1,633 sq ft parking/car and trailer incl ramp facility
3. Turnover factor of 1.5

This information is then applied to the following formula to arrive at the necessary acreage requirements for each activity.

$$AR = \frac{D \times a}{CD \times TF \times 43,560}$$

Where AR = acreage requirement

D = demand for respective activity in summer activity days

a = area per person in square feet for respective facilities

CD = capacity days

TF = turnover factor

43,560 = square feet per acre

The sum of the five acreage requirements yields the developed acreages necessary for the provision of adequate opportunity for these basic activities. This total is considered as the minimum acceptable amount of developed land to be provided in the basin (or zone). The existing developed acreages were subtracted from zone requirements to indicate the amount of developed land still needed (appropriately labeled "deficit").

Determining Future Resource Requirements. Except for the demand figures, the same factors employed in the present resource requirements determination were used in the future resource requirements computation. In lieu of the present demand figures, the 2000 and 2020 "with opportunity" demand figures were utilized in the future requirements calculations. The results are shown in Table 5-2 in Chapter 5.

Appendix C

Inventory of Existing Recreation Areas in Lake Huron Basin

Sources: 1, 4, 5, 6, 21, 22, 27, 39, 57

FEDERAL RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 1												
	Hiawatha National Forest			199,040*									
F-1	Dick Recreation Campground	Chippewa	Pine River	2	X			X	X	X	X		n.a.
F-2	Carp River Campground	Mackinac	Carp River	17	X		X	X	X	X	X		6,175
F-3	Pontchartrain Pt. Campground	Mackinac	St. Martin Bay	n.a.**					X	X	X		n.a.
F-4	Foley Creek Campground	Mackinac	Foley Creek	30					X	X	X		8,430
	Huron National Forest			413,739	X	X	X	X	X	X	X		1,179,720
F-5	Mack Lake Campground	Oscoda	Au Sable River	4	X	X			X	X	X		4,000
F-6	Wagner Lake Campground	Oscoda	Au Sable River	4	X	X		X		X	X		6,000
F-7	Loon Lake Campground	Oscoda	Au Sable River	7	X	X	X	X	X	X	X		30,000
F-8	Island Lake Campground	Oscoda	Au Sable River	11	X	X	X	X	X	X	X		16,000
F-9	Horseshoe Lake Campground	Alcona	Au Sable River	4	X			X		X	X		300
F-10	Pine River	Alcona	Au Sable River	11	X			X	X	X	X		1,200
F-11	Rollways Campground	Iosco	Au Sable River	14	X			X	X	X	X		8,000
F-12	Lumberman's Monument Campground and Picnic Area	Iosco	Au Sable River	14					X	X	X		97,000
	ZONE 2												
F-16	Shiawassee National Wildlife Ref.	Saginaw	Saginaw River	3,400	X			X					15,000
	ZONE 3												
	Huron National Forest (con.)												
F-13	Corsair Picnic Area	Iosco	Small Streams Tributary	4	X			X	X				2,000
F-14	Round Lake Campground	Iosco	Small Streams Tributary	15	X	X	X	X		X	X		23,000
F-15	Sand Lake Campground	Iosco	Small Streams Tributary	10	X	X		X	X				5,000

* Total forest acreage within Lake Huron watershed.
** Not Available.

STATE RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 1												
S-1	Munuscong State Forest	Chippewa	Munuscong River	119,520	X	X	X	X	X	X			105,500
S-2	DeTour State Park	Chippewa	Lake Huron	395	X	X	X	X	X	X		X	26,000
S-3	Straits State Park	Mackinac	Lake Huron	120	X	X	X	X	X	X	X		133,000
S-4	Mackinac Island State Park*	Mackinac	Lake Huron	3,000	X	X	X	X	X	X			1,043,489
S-5	Cheboygan State Park	Cheboygan	Lake Huron	1,246	X	X	X	X	X	X	X		37,515
S-6	Hardwood State Forest	Cheboygan	Black River	188,070	X	X	X	X	X	X			460,900
S-7	Aloha State Park	Cheboygan	Black River	76	X	X	X	X	X	X	X		144,774
S-8	Burt Lake State Park	Cheboygan	Sturgeon River	410	X	X	X	X	X	X			215,390
S-9	Lake Huron Dunes Roadside Park	Presque Isle	Lake Huron	10					X				25,000
S-10	P. H. Hoeft State Park	Presque Isle	Lake Huron	300	X	X			X	X			43,000
S-11	Onaway State Park	Presque Isle	Rainy River	160	X		X	X		X		X	97,094
S-12	Black Lake State Forest	Presque Isle	Lake Huron	146,350	X	X	X	X	X	X	X		370,400
S-13	Pigeon River State Forest	Otsego	Pigeon River	176,990	X	X	X	X	X	X			551,400
S-14	Otsego Lake State Park	Otsego	Au Sable River	70	X	X	X	X	X	X			107,115
S-15	Thunder Bay River State Forest	Montmorency	Thunder Bay River	189,470	X	X	X	X	X	X			643,800
S-16	Clear Lake State Park	Montmorency	Thunder Bay River	n.a.									(Under development)
S-17	Alpena State Forest	Alpena	Thunded Bay River	73,950	X	X	X	X	X	X			278,850
S-18	Edward E. Hartwick Pines St. Pk.	Crawford	Au Sable River	8,930	X			X	X	X	X		222,415
S-19	Au Sable State Forest	Crawford	Au Sable River	290,770	X	X	X	X	X	X			768,000
S-20	Sturgeon Point State Park	Alcona	Lake Huron	70									(Under development)
S-21	Harrisville State Park	Alcona	Lake Huron	80	X	X	X	X	X	X		X	76,444
S-22	Rifle River Recreation Area	Ogemaw	Rifle River	4,329	X	X	X	X	X	X			32,189
	ZONE 2												
S-23	Wilson State Park	Clare	Tittabawassee River	32	X	X	X	X	X	X	X		193,720
S-24	Gladwin State Recreation Area	Gladwin	Tittabawassee River	365	X		X	X					1,000
S-25	Chippewa River State Forest	Mecosta	Chippewa River	61,360	X	X	X	X	X	X			176,900
S-26	Edmore State Game Area	Montcalm	Pine River	1,741	X			X	X	X			2,560
S-27	Shiawassee River Game Area	Saginaw	Shiawassee River	7,449	X		X	X		X			20,300
S-28	Gratiot-Saginaw Game Area	Saginaw	Bad River	12,610					X	X			36,000
S-29	Deford State Game Area	Tuscola	Cass River	9,328	X	X		X	X	X			5,530
S-30	Tuscola State Game Area	Tuscola	Cass River	8,104					X	X			7,560
S-31	Vassar State Game Area	Tuscola	Cass River	2,680	X	X	X	X	X	X			3,565
S-32	Murphey Lake State Game Area	Tuscola	Cass River	2,600	X	X	X	X	X	X			6,080
S-33	Lapeer State Game Area	Lapeer	Flint River	6,934	X	X	X	X	X	X			n.a.
S-34	Metamore-Hadley State Recreation Area	Lapeer	Flint River	680	X	X	X	X	X	X		X	245,000
S-35	Ortonville State Recreation Area	Lapeer	Flint River	3,850	X	X	X	X	X	X		X	172,436
S-36	Holly State Recreation Area	Oakland	Flint River	6,270	X	X	X	X	X	X			451,000
S-37	Oak Grove State Game Area	Livingston	Shiawassee River	1,797	X	X	X	X	X	X			10,100
	ZONE 3												
S-38	Tawas Point State Park	Iosco	Lake Huron	170	X	X	X	X	X				5,000
S-39	Ogemaw State Forest	Ogemaw	Rifle River	182,900	X	X	X	X	X	X			776,000

* Administered by Mackinac Island State Park Commission (autonomous from Department of Conservation). Source: 52

STATE RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 3 (con.)												
S-40	Nayanquing Point Wildlife Area	Bay	Lake Huron	710	X		X	X					16,300
S-41	Tibico Marsh State Game Area	Bay	Lake Huron	1,465	X			X					9,500
S-42	Bay City State Park	Bay	Lake Huron	196	X	X	X	X	X	X			350,053
S-43	Quanicassee Wildlife Area	Bay	Lake Huron	220	X		X	X					1,500
S-44	Veterans Roadside Park	Saginaw	Saginaw River	70					X				150,000
S-45	Crow Island State Game Area	Saginaw	Saginaw River	1,108	X			X					1,500
S-46	Fish Point Wildlife Area	Tuscola	Saginaw Bay	3,026	X			X		X			42,030
S-47	Albert E. Sleeper State Park	Huron	Saginaw Bay	1,040	X	X	X	X	X	X			207,533
S-48	Port Crescent State Park	Huron	Saginaw Bay	160	X	X	X	X		X			2,489
S-49	Minden City State Game Area	Sanilac	Cass River	5,784					X	X			805
S-50	Lakeport State Park	St. Clair	Lake Huron	374	X	X	X	X	X	X			336,572

LOCAL RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 1												
L-1	Trout Lake Township Park	Chippewa	Carp River	n.a.									n.a.
L-2	4-H Center-Kinross Lake	Chippewa	Munuscong River	38	X		X	X	X				n.a.
L-3	Duke's Lake Campground	Chippewa	Munuscong River	26					X	X			n.a.
L-4	Drummond Township Park	Chippewa	Sturgeon Bay	n.a.									n.a.
L-5	Clark Township Public Dock	Mackinac	Lake Huron	1	X		X						n.a.
L-6	Larks Lake Pioneer County Park	Emmet	Maple River	20	X	X	X	X	X				2,500
L-7	Oden Park Site	Emmet	Maple River	1	X		X	X	X				n.a.
L-8	Douglas Lake Picnic Area	Cheboygan	Maple River	5					X				n.a.
L-9	Topinabee Public Park and Beach	Cheboygan	Mullet Lake	11	X	X	X	X	X				n.a.
L-10	Sturgeon River County Park	Cheboygan	Sturgeon River	20	X			X	X				3,000
L-11	Roger's City Parkside Beach	Presque Isle	Lake Huron	7	X	X	X	X	X				25,000
L-12	Fletcher Park	Presque Isle	Thunder Bay River	160	X	X	X	X	X	X			n.a.
L-13	Hudson Township Park	Charlevoix	Sturgeon River	4					X				n.a.
L-14	Wilkinson Memorial Park	Otsego	Sturgeon River	5					X				n.a.
L-15	Otsego County Park	Otsego	Au Sable River	20					X	X			780
L-16	Pleasant View Park	Otsego	Au Sable River	n.a.									n.a.
L-17	Clear Lake County Park	Montmorency	Black River	19	X	X	X	X	X	X			175
L-18	Briley Township Park	Montmorency	Thunder Bay	n.a.									n.a.
L-19	Crooked Lake Township Park	Montmorency	Thunder Bay River	n.a.					X				n.a.
L-20	M33 County Park	Montmorency	Thunder Bay River	n.a.									n.a.
L-21	Alpena County Park	Alpena	Lake Huron Tributary	40	X	X	X	X	X	X			11,500
L-22	Long Lake County Park	Alpena	Lake Huron Tributary	29	X	X	X	X	X	X			n.a.
L-23	Maple Ridge Township Park	Alpena	Thunder Bay River	45	X	X	X	X	X	X			7,700
L-24	Long Rapids County Park	Alpena	Thunder Bay River	15	X		X	X	X	X			n.a.
L-25	Michekewis City Park	Alpena	Thunder Bay	n.a.									n.a.
L-26	Beaver Lake County Park	Alpena	Thunder Bay River	12	X	X	X	X	X	X			12,800
L-27	J. L. Sanborn County Park	Alpena	Thunder Bay	n.a.									n.a.
L-28	Beaver Creek County Roadside Park	Crawford	Au Sable River	8					X				n.a.
L-29	Clinton Township, Bass Lake Park	Oscoda	Thunder Bay River	n.a.									n.a.
L-30	Clinton Township, Saddle Back L. Pk.	Oscoda	Thunder Bay River	n.a.									n.a.
L-31	Comins Township Park	Oscoda	Au Sable River	n.a.									n.a.
L-32	Luzerne Township Park	Oscoda	Au Sable River	n.a.									n.a.
L-33	Oscoda County Park	Oscoda	Au Sable River	68	X	X	X	X	X	X	X		3,475
L-34	Mentor Township Park	Oscoda	Au Sable River	30	X		X	X	X	X			n.a.
L-35	Mitchell Township Park	Alcona	Thunder Bay River	n.a.									n.a.
L-36	Harrisville City Public Fishing S.	Alcona	Lake Huron	n.a.									n.a.
L-37	Alcona County Park	Alcona	Au Sable River	100	X	X	X	X	X	X	X		16,800
L-38	Old Orchard County Park	Iosco	Au Sable River	210	X	X	X	X	X	X			53,400
	ZONE 2												
L-39	Clare Roadside Park	Clare	Tittabawassee	3					X				n.a.
L-40	Grant Township Park	Clare	Tittabawassee	n.a.									n.a.
L-41	Clare Rest Area	Clare	Tittabawassee	8					X				n.a.
L-42	Barryton Park	Mecosta	Chippewa River	4					X	X			n.a.

LOCAL RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 2 (con.)												
L-43	Coldwater Township Park	Isabella	Chippewa River	n.a.									n.a.
L-44	Coldwater Lake County Park	Isabella	Chippewa River	40	X	X	X	X	X	X			26,500
L-45	Bloomfield Township Park	Isabella	Pine River	n.a.	X		X	X	X	X			n.a.
L-46	Island Park	Isabella	Chippewa River	n.a.									n.a.
L-47	Indian Mound Park	Isabella	Pine River	n.a.									n.a.
L-48	Hope Community Park	Midland	Tittabawassee River	3					X				n.a.
L-49	Midland County Veterans Mem. Pk.	Midland	Tittabawassee River	130					X			X	2,500
L-50	Frankenmuth Memorial Park	Saginaw	Cass River	20	X		X	X	X				n.a.
L-51	Indian Fields Township Park	Tuscola	Cass River	60	X			X	X				n.a.
L-52	Evergreen Township Park	Sanilac	Cass River	30	X		X	X	X	X			n.a.
L-53	Snover Memorial Park	Sanilac	Cass River	3					X				n.a.
L-54	Henderson Park	Shiawassee	Shiawassee River	20	X			X	X				4,000
L-55	Shaytown Park	Shiawassee	Shiawassee River	7	X		X	X	X				n.a.
L-56	Richfield Park	Genesee	Flint River	342	X		X	X	X				156,000
L-57	Kearsley Park	Genesee	Flint River	65	X	X			X				60,000
L-58	McKinley Park	Genesee	Flint River	140	X	X		X	X				30,000
L-59	Linden Park	Genesee	Flint River	135	X	X			X				200,000
L-60	Sulten Recreation Area	Lapeer	Flint River	40					X	X			n.a.
L-61	Stony Lake Park	Oakland	Flint River	40	X	X	X	X	X				n.a.
L-62	Davisburg Park	Oakland	Shiawassee River	178					X	X			n.a.
L-63	Lake Chemung Roadside Park	Livingston	Shiawassee River	2					X				n.a.
	ZONE 3												
L-64	Ogemaw County Park	Ogemaw	Rifle River	40	X	X	X	X	X	X			5,000
L-65	Mills Township Park	Ogemaw	Rifle River	n.a.									n.a.
L-66	Plainfield Township Park	Iosco	Lake Huron Tributary	n.a.									n.a.
L-67	Tawas Beach Club Park	Iosco	Lake Huron Tributary	n.a.									n.a.
L-68	Whitney Township Park	Arenac	Lake Huron Tributary	10	X	X	X		X				n.a.
L-69	Arenac County Park	Arenac	Lake Huron Tributary	47					X	X			n.a.
L-70	Bigelow Park	Bay	Saginaw River	80	X			X					n.a.
L-71	Sovereign Park	Bay	Saginaw River	33	X		X	X					13,000
L-72	War Memorial Park	Bay	Saginaw River	50	X		X	X	X			X	110,000
L-73	Wicks Park	Saginaw	Saginaw River	80	X		X	X	X				n.a.
L-74	Rust Park	Saginaw	Saginaw River	159	X	X	X	X	X				88,000
L-75	Vanderbilt County Park	Tuscola	Saginaw Bay	20	X	X	X	X	X	X			n.a.
L-76	Sebewaing Township Park	Huron	Saginaw Bay	6	X		X	X	X				n.a.
L-77	Caseville County Park	Huron	Saginaw Bay	42	X	X	X	X	X	X	X		185,000
L-78	Oak Beach County Park	Huron	Saginaw Bay	353	X	X	X	X	X	X			20,000
L-79	McGraw Park	Huron	Saginaw Bay	4	X	X			X				n.a.
L-80	Port Austin County Park	Huron	Saginaw Bay	7	X		X	X	X	X	X		8,000
L-81	Port Austin City Harbor & Beach	Huron	Saginaw Bay	4	X	X	X	X	X				n.a.
L-82	Grindstone City County Park	Huron	Lake Huron	1					X				n.a.
L-83	Philip Park	Huron	Lake Huron	2	X	X			X				n.a.
L-84	Lighthouse County Park	Huron	Lake Huron	89	X	X	X	X	X	X			10,000

LOCAL RECREATION AREAS

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 3 (con.)												
L-85	Stafford County Park	Huron	Lake Huron	23	X	X		X	X	X			5,000
L-86	Harbor Beach City Beach	Huron	Lake Huron	6	X	X	X	X					n.a.
L-87	Wagener County Park	Huron	Lake Huron	58	X	X	X	X	X	X			5,000
L-88	Sanilac County Park	Sanilac	Lake Huron	22	X	X	X	X	X	X	X		17,000
L-89	Port Sanilac Harbor	Sanilac	Lake Huron	3	X		X	X	X				15,000
L-90	Lexington City Beach	Sanilac	Lake Huron	5	X	X	X	X	X				n.a.
L-91	Burtchville Township Park	St. Clair	Lake Huron	7	X		X	X	X				n.a.

STATE WATER ACCESS SITES

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
	ZONE 1												
A-1	Frenchman Lake Pub. Fish. Site	Chippewa	Carp River	1	X		X	X					3,000
A-2	Caribou Lake Pub. Fish. Site	Chippewa	Caribou Creek	2	X		X	X					1,000
A-3	Maple River Pub. Fish. Site	Emmet	Maple River	1,834	X		X	X		X			n.a.
A-4	Round Lake Pub. Fish. Site	Emmet	Maple River	6	X		X	X					60
A-5	Pickerel Lake Pub. Fish. Site	Emmet	Maple River	3	X		X	X					100
A-6	Lancaster Lake Pub. Fish. Site	Cheboygan	Maple River	6	X		X	X					n.a.
A-7	Munro Lake Pub. Fish. Site	Cheboygan	Maple River	22	X		X	X		X			n.a.
A-8	Cheboygan River Pub. Fish. Site	Cheboygan	Cheboygan River	5	X		X	X					100
A-9	Mullet Lake Pub. Fish. Site	Cheboygan	Cheboygan River	2	X		X	X					400
A-10	Long Lake Pub. Fish. Site	Cheboygan	Black River	4	X		X	X					n.a.
A-11	Roberts-Cochran Lakes Pub. Fish. S	Cheboygan	Pigeon River	230	X		X	X					n.a.
A-12	Sturgeon River Pub. Fish. Site (3)	Cheboygan	Sturgeon River	353	X		X	X	X	X			n.a.
A-13	Silver Lake Pub. Fish. Site	Cheboygan	Sturgeon River	9	X		X	X					500
A-14	Lost Lake Pub. Fish. Site	Presque Isle	Lake Huron Tributary	1	X		X	X					100
A-15	Lake Nettie Pub. Fish. Site	Presque Isle	Lake Huron Tributary	4	X		X	X					300
A-16	Lake Emma Pub. Fish. Site	Presque Isle	Lake Huron Tributary	16	X		X	X		X			n.a.
A-17	Grand Lake Pub. Fish. Site	Presque Isle	Lake Huron Tributary	1	X		X	X		X			n.a.
A-18	Long Lake Pub. Fish. Site	Presque Isle	Lake Huron Tributary	n.a.	X		X	X					n.a.
A-19	Lake Louise (or Thumb) Pub. Fish. Site	Charlevoix	Sturgeon River	n.a.	X		X	X					n.a.
A-20	Pigeon River Pub. Fish. Site	Otsego	Pigeon River	2	X		X	X		X			390
A-21	Twenty-seven Lake Pub. Fish. Site	Otsego	Sturgeon River	1	X		X	X					110
A-22	Five Lakes Pub. Fish. Site	Otsego	Sturgeon River	n.a.	X		X	X					n.a.
A-23	Big Lake Pub. Fish. Site	Otsego	Pigeon River	1	X		X	X					190
A-24	Dixon Lake Pub. Fish. Site	Otsego	Au Sable River	4	X		X	X					160
A-25	Lake Manuka Pub. Fish. Site	Otsego	Au Sable River	8	X		X	X		X			n.a.
A-26	Opal Lake Pub. Fish. Site	Otsego	Au Sable River	4	X		X	X		X			490
A-27	Heart Lake Pub. Fish. Site	Otsego	Au Sable River	1	X		X	X					n.a.
A-28	Bradford Lake Pub. Fish. Site	Otsego	Au Sable River	4	X		X	X		X			n.a.
A-29	Avalon Lake Pub. Fish. Site	Montmorency	Thunder Bay River	8	X		X	X					n.a.
A-30	Crooked Lake Pub. Fish. Site	Montmorency	Thunder Bay River	3	X		X	X					400
A-31	East Twin Lake Pub. Fish. Site	Montmorency	Au Sable River	1	X		X	X					800
A-32	Thunder Bay River Pub. Fish. Site	Alpena	Thunder Bay River	2	X		X	X		X			210
A-33	Fletcher Pond Pub. Fish. Site	Alpena	Thunder Bay River	6	X		X	X					400
A-34	Stephens Bridge Pub. Fish. Site	Crawford	Au Sable River	5	X		X	X					760
A-35	McMasters Bridge Pub. Fish. Site	Crawford	Au Sable	2	X		X	X					690
A-36	Beaver Creek Pub. Fish. Site	Crawford	Au Sable River	n.a.	X		X	X					n.a.
A-37	Tea Lake Pub. Fish. Site	Oscoda	Au Sable River	3	X		X	X					310
A-38	McCollum Lake Pub. Fish. Site	Oscoda	Thunder Bay River	80	X	X	X	X	X	X			500
A-39	Au Sable River Pub. Fish. Site (2)	Oscoda	Au Sable River	40	X		X	X		X			n.a.
A-40	Big Creek Pub. Fish. Site	Oscoda	Au Sable River	n.a.	X		X	X					n.a.
A-41	Mio Pond Pub. Fish. Site	Oscoda	Au Sable River	12	X	X	X	X	X	X			350
A-42	Hubbard Lake Pub. Fish. Site (2)	Alcona	Pine River	6	X		X	X		X			890
A-43	Lake St. Helen Pub. Fish. Site	Roscommon	Au Sable River	1	X		X	X					n.a.
A-44	Horseshoe Lake Pub. Fish. Site	Ogemaw	Au Sable River	1	X		X	X					n.a.
A-45	Clear Lake Pub. Fish. Site	Ogemaw	Au Sable River	1	X			X					n.a.

*Each site provides car parking space and boat launching facility.

STATE WATER ACCESS SITES

SITE NO.	NAME	COUNTY	ADJACENT WATER	AREA (acres)	WATER DEPENDENT	SWIMMING	BOATING	FISHING	PICNICKING	TENT CAMPING	TRAILER CAMPING	GROUP CAMPING	1963 VISITATION
A-46	George Lake Pub. Fish. Site	Ogemaw	AuSable River	1	X			X					170
A-47	Long Lake Pub. Fish. Site	Iosco	Lake Huron Tributary	8	X		X	X		X			650
A-48	Cedar Lake Pub. Fish. Site	Iosco	Lake Huron Tributary	2	X		X	X					190
A-49	Au Sable River Pub. Fish. Site	Iosco	Au Sable River	2	X			X		X			n.a.
	ZONE 2												
A-50	Lake Four Pub. Fish. Site	Gladwin	Tittabawassee River	1	X		X	X					900
A-51	Pratt Lake Pub. Fish. Site	Gladwin	Tittabawassee River	1	X		X	X					3,500
A-52	Wiggins Lake Pub. Fish. Site	Gladwin	Tittabawassee River	32	X	X	X	X	X	X			1,500
A-53	Wixom Lake Pub. Fish. Site	Gladwin	Tittabawassee River	2	X		X	X					6,000
A-54	Cranberry Lake Pub. Fish. Site	Clare	Tittabawassee River	8	X		X	X					600
A-55	Little Long Lake Pub. Fish. Site	Clare	Tittabawassee River	2	X		X	X					3,000
A-56	Crooked Lake Pub. Fish. Site	Clare	Tittabawassee River	2	X		X	X					1,200
A-57	Perch Lake Pub. Fish. Site	Clare	Tittabawassee River	1	X		X	X					200
A-58	Tobacco River Pub. Fish. Site	Clare	Tittabawassee River	20	X		X	X	X	X			3,200
A-59	Five Lakes Pub. Fish. Site	Clare	Tittabawassee River	4	X		X	X					2,000
A-60	Chippewa Lake Pub. Fish. Site	Mecosta	Chippewa River	1	X		X	X					890
A-61	Littlefield Lake Pub. Fish. Site	Isabella	Chippewa River	10	X		X	X		X			630
A-62	Pine River Pub. Fish. Site	Isabella	Pine River	2	X		X	X		X			n.a.
A-63	Nepessing Lake Pub. Fish. Site	Lapeer	Flint River	1	X		X	X					18,000
A-64	Fenton Lake Pub. Fish. Site	Genesee	Shiawassee River	4	S		S	S					25,000
A-65	Lobdell Lake Pub. Fish. Site	Genesee	Shiawassee River	17	X		X	X		X	X		15,500
A-66	Tipsico Lake Pub. Fish. Site	Oakland	Shiawassee River	3	X		X	X					10,000
A-67	Shiawassee River Pub. Fish. Site	Oakland	Shiawassee River	110	X		X	X					3,500
A-68	Lake Chemung Pub. Fish. Site	Livingston	Shiawassee River	3	X		X	X					1,800
	ZONE 3												
A-69	Sages Lake Pub. Fish. Site	Ogemaw	Rifle River	6	X		X	X					240
A-70	Peach Lake Pub. Fish. Site	Ogemaw	Rifle River	2	X		X	X					320
A-71	Rifle River Pub. Fish. Site	Ogemaw	Rifle River	40	X		X	X		X			400
A-72	Hardwood & Long Lakes Pub. Fish. S	Ogemaw	Rifle River	18	X		X	X		X			210
A-73	Lake George Pub. Fish. Site	Ogemaw	Tittabawassee River	3	X		X	X					260
A-74	Au Gres River Pub. Fish. Site	Arenac	Lake Huron Tributary	1	X		X	X					2,000
A-75	Saginaw Bay Pub. Fish. Site (3)	Huron	Saginaw Bay	149	X		X	X		X			n.a.
A-76	Eagle Bay Pub. Fish. Site	Huron	Lake Huron	2	X		X	X					3,000

Appendix D

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Appendix E

Views of Other Interests

Copies of letters commenting on the preliminary report of the Lake Huron Basin have been made a part of this report and are listed by agency in the index on the following page. Approximately 40 copies of the preliminary draft of this report were sent to applicable federal, state, and local governmental agencies for their review. Comments of the reviewing agencies are fully appreciated for their value in improving the quality of the final report. All comments were weighed carefully and are, in many cases, reflected by changes made in the final report. In a few instances, the original choice of words in the preliminary report tended to distort the meaning of a particular section of the report. We believe that modifications to the wording has clarified the meaning and intent of these sections. In some instances, disagreements with the philosophy or wording of the report were indicated. Where comments were considered valid, we incorporated changes.

A few items, especially in regard to water quality as it affects recreational activity, such as the influence that septic tank systems have upon the quality of basin lakes and streams, were viewed differently by this bureau. The primary purpose of this report was to investigate and to report the impact of water quality upon recreation in the basin, and to that purpose this bureau has addressed the study with the ultimate goal of providing optimum water-oriented outdoor recreation opportunities without quality deterioration.

Revisions of portions of the report based on not only reviews of other agencies but on additional considerations of this office resulted in considerable modifications of the report's original conclusions and recommendations. This necessitated later distribution of the revised conclusions and recommendations to those agencies most concerned. Thus, there are enclosed two letters from several reviewing agencies.

It is our hope that this report will encourage further efforts to improve the basin's environmental quality including better quality waters for outdoor recreation and will assist responsible administering agencies of all levels in planning and managing the recreational resources of the Lake Huron Basin.

INDEX OF REPLIES RECEIVED

U. S. DEPARTMENT OF AGRICULTURE

Forest Service E-5, 7

Soil Conservation Service E-11, 13

U. S. DEPARTMENT OF THE ARMY

Corps of Engineers, Chicago District E-17

Corps of Engineers, Detroit District E-19

Corps of Engineers, Lake Survey District E-21

U. S. DEPARTMENT OF THE INTERIOR

Bureau of Commercial Fisheries E-23

Bureau of Sport Fisheries and Wildlife E-25, 27, 29

Federal Water Pollution Control Administration E-31

STATE OF MICHIGAN

Department of Natural Resources, Recreation Planning Division E-33, 35

Water Resources Commission E-37

GENESEE COUNTY

Metropolitan Planning Commission E-39

CITY OF MIDLAND

Parks and Recreation Department E-43

GPO 816-802-2

C UNITED STATES DEPARTMENT OF AGRICULTURE
O FOREST SERVICE
P EASTERN REGION
Y 633 W. Wisconsin Ave., Milwaukee, Wisconsin 53203

In Reply Refer To
2340

November 22, 1968

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

We appreciate the opportunity to review the revision of the "Lake Huron Basin" report.

In our opinion you have covered the major needs in your recommendations. We are especially pleased to see that you have included Items #3, #7, and #9.

Sincerely yours,

(Signature)
H. A. SVENSON
Chief, Recreation, Range
and Wildlife

C UNITED STATES DEPARTMENT OF AGRICULTURE
O FOREST SERVICE
P EASTERN SECTION
Y 633 W. Wisconsin Ave., Milwaukee, Wisconsin 53203

In Reply Refer To

2340

November 16, 1967

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings :

This is in response to your letter of October 13 (D6427GL) asking for comments on the preliminary draft of your report, "Water-Oriented Outdoor Recreation - Lake Huron Basin."

We believe the report does a good job covering the over-all objectives of the study.

For your consideration, we offer the following comments and suggestions:

Page 4-1, Private. The last sentence of the second paragraph is confusing. It is difficult to understand what facilities, public or commercial, cater specifically to the seasonal homeowner. The latter half of this sentence is clear and can stand on its own.

The first sentence of the last paragraph gives the impression that all commercial enterprises either supplement or compete with public facilities. Summer resorts, a major segment of the vacation industry, certainly are not supplemental. As pointed out by I.V. Fine, et al, in their study of tourist accommodations in Wisconsin, it is by no means established that public facilities are detrimental to resort enterprises. We agree, however, that private campgrounds are sometimes in competition with public facilities.

Page 4-7, 3a, Zone 1. We suggest the fourth sentence regarding 1,722,000 acres of State and Federal lands be amplified to point out that these lands comprise the largest ownerships of public hunting area available in this basin.

Page 4-29 (3), Cross-Country Motoring. To the sixth sentence, we suggest the addition of, "however, there is substantial mileage of old logging roads on the National Forests available for this use." If the same situation exists on the State forests in the basin, they can be covered in the same statement.

Page 4-32. The National Forest lands are a very significant hunting area in the basin. Maintenance and improvement of hunting habitat is given full consideration in resource management decisions and practices. Cooperative programs with the State are carried out. We believe a statement about the availability of National Forest area is warranted in this discussion.

Page 7-5, 5th Sentence. Is this appropriate as a general statement? The public pays for many recreation activities at present: resort accommodations, guide service, golf, swimming, and camping, to name a few. The long experience of the Lake States in charging entrance and user fees for recreation facilities would indicate general acceptance. The same is true of our experience on National Forests. The public in general apparently is willing to pay nominal fees for camping facilities, but perhaps is not willing to pay such fees if they actually covered operating costs or if they include amortization of facilities.

Page 9-1, Recommendations. Under No. 5 we suggest the addition of another item: Many venturing into recreation enterprises do not understand basic planning needs, nor good management practices, and are unsuccessful. To provide this type of "know-how" it may be appropriate to recommend the establishment of short university courses for recreation operators covering planning and desirable management practices.

Recommendation 3. We do not believe this recommendation is desirable. State and Federal Forests, as against State Parks, are managed for a variety of resources (multiple use), one of which is recreation. The State Parks, however, are managed primarily for recreation. It is long established policy of the Forest Service to provide for a wide variety of recreation opportunities on the National Forests to meet peoples' needs. This includes developed recreation facilities and commercial facilities, developed by private investment under lease arrangement; such as boat liveries, resorts, winter sports, etc. However, the preponderance of National Forest areas will always be available for dispersed activities, such as listed in the proposed recommendation.

Recommendation 5c. This is not clear as to what is meant in this recommendation. Does this mean that public agencies should make a declaration of the extent of long range development by public investment, or a statement as to the extent of private investment which will be planned on public lands under lease arrangement? The Forest Service has long standing policies concerning the types of developments which will not be provided on National Forests by investments of public funds, but which will be encouraged for development by private capital.

The copy of the report sent with your letter is enclosed.

Sincerely yours,

H. A. SVENSEN
Assistant Regional Forester

(Signature)
By: H. V. ZIMINSKI

Enclosure

C UNITED STATES DEPARTMENT OF AGRICULTURE
O SOIL CONSERVATION SERVICE
P Room 101, 1405 S. Harrison Road
Y East Lansing, Michigan 48823

November 29, 1968

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

We have reviewed the revised copy of the conclusions and recommendations of your report on "Water-Oriented Outdoor Recreation - Lake Huron Basin." They are thought to cover that facet of the field in which the Soil Conservation Service has an interest and incorporates our original comments of November 16, 1967.

The recommendations developed were of particular interest. We noticed that several of them relate either directly or indirectly to activities having a relationship to the work in which our agency is engaged.

Let us know if we can be of any further assistance with this report.

Sincerely yours,

VERNE M. BATHURST
State Conservationist

(Signature)
BY: Robert S. Fellows, Acting

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Room 101, 1405 S. Harrison Road
East Lansing, Michigan 48823

November 16, 1967

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

We were very please to have had the opportunity to review your report, "Water-Oriented Outdoor Recreation - Lake Huron Basin." This report is an interesting and informative discussion of the present and future recreation conditions in this basin. The following are our comments and suggestions:

1. Page 1-3, Section E, EFFECTIVE POPULATION - "tjht" is misspelled.
2. Page 1-5, Paragraph 1, 1st sentence - "cityoof" is a typographical error
3. Page 2-7, Paragraph 1, 1st sentence - "white-tailed deer" should be hyphenated and "waterfowl" should be written as one word.
4. Page 2-7, Paragraph 2, 1st sentence - last word should be "lamprey."
5. Page 2-7, Paragraph 3 - "bluegill" should be written as one word.
6. Page 209, Paragraph 2 & 3 - words "short-term" and "long-term" should be hyphenated.
7. Page 2-18, Paragraph 1, 4th sentence - The statement that one of the factors contributing to the low per capita income is a high number of retirees does not seem consistent with the statement on page 2-24 that the median age is lower than the National.
8. Page 2-20, Plate 2-10 - The Interstate Highways I-96, I-94, and I-75 are not labeled correctly.
9. Page 2-23, Paragraph b., 2nd sentence - "thaturban" is a typographical error.
10. Page 3-5, Paragraph 2, 2nd sentence - the second 2000 should be 2020.

11. Page 4-2, 4-3, 4-19 - Plates should be footnoted to refer to Appendix C for name and facilities corresponding to numbers on the maps.

12. Page 4-9, 1st full paragraph, 1st sentence - "Zones" should be read "Zone 2".

13. Page 4-11, 1st line - The statement that the soils are "non productive" is incorrect. North of Bay City the combination of climatic and soil factors make agriculture less productive.

14. Page 4-28, Last line - "interstered" is a typographical error.

15. Page 6-1, Paragraph 2, 7th sentence - Tiled fields do not transport sediment. This sentence possibly could include, "Poor land use and improper land treatment practices on the land adjoining the rivers and long the stream banks are largely responsible for the great quantities of soil reaching the waterways."

16. Page 6-2, Last paragraph, 2nd sentence - See comment for page 6-1.

17. Page 6-4, Paragraph 1, 3rd sentence - Possibly "total alkalinity" should be considered for inclusion in the sentence with "water temperature, oxygen content, turbidity, and pH."

18. Page 6-9, Table 6-2 - This table gives the percent change in attendance from year to year. A clearer comparison of use would be obtained by indicating the percent of the 1961 value. This would give values for the attendance at Bay City State Park of 100.0, 108.9, 113.9, 85.4, 79.7, and 91.1 percent of 1961 attendance for the years 1961 through 1966 respectively.

19. Page 6-16, Plate 6-7 - There is no legend given for solid black area as shown on Swartz Creek. Several county lines are missing on this map.

20. Page 9-2, Item 10 - Shouldn't all construction and not just highway construction be investigated?

21. B-1, Last paragraph - "22,600" should be "22,600,000."

22. B-3, Zone Demands - This section speaks of five zones while the rest of the report lists only three zones.

23. Page following B-8 - Title cover to Appendix C should be Lake Huron rather than Lake Ontario.

24. Appendix C - The tables should have a title indicating what is inventoried, i.e., Water Access Sites, Local Recreation Areas, etc. Also, reference should be made to Plates 4-1, 4-2, and 4-10 for map locations.

I hope you will find these comments useful in your revisions of this report.

Sincerely yours,

(Signature)
VERNE M. BATHURST
State Conservationist

COPY

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS
215 South Dearborn Street
Chicago, Illinois 60604

In Reply Refer To
NCCED-DER
29 November 1967

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

The preliminary draft of your report "Water-Oriented Outdoor Recreation - Lake Huron Basin" has been reviewed and is returned as requested.

This report, though preliminary, is generally comprehensive, well organized, and clearly presented, and in final draft will be a direct contribution to the "Great Lakes - Illinois River Basin Comprehensive Study" conducted by the Federal Water Pollution Control Administration.

Sincerely yours,

(Signature)
R. F. LEEPER
Chief, Engineering Division

1 Incl.
Prelim. Rpt.
dtd Oct 67

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DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
P.O. Box 1027 150 Michigan Avenue
Detroit, Michigan 48231

In Reply Refer To
NCEED-B

14 November 1967

Mr, Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

Thank you for the opportunity to review your preliminary report "Water-Oriented Outdoor Recreation - Lake Huron Basin." We have found the report to be well written and timely. It will serve as a valuable planning aid to all who are concerned with the Lake Huron Basin.

Most of our comments are minor referring to typographic errors and these are noted on the inclosed copy of your report which we are returning as requested. The following informal comments are offered for your consideration.

One page 1-1, paragraph B, the term "basin" was introduced without defining it. It is believed that it was to mean that portion of Lake Huron's drainage basin within the United States. In paragraph C of the same page the term "basins" is used again without a clarification, here it was used to refer to river sub-basins within the Lake Huron drainage basin. We suggest that the term "basin" be clearly defined when first used and when departures from this definition are necessary that they can be clarified when they occur.

On Plate 2-2, page 2-3, the plotting points for air and water surface temperatures on "Water and Air Temperature Graph Legend" are mislabled. The data presented in "Limiting Physical Factors" on the same plate is misleading unless the very special application intended for this graph is given. For example, no wind or wave data are given for the winter months. This probably results from lack of recorded data and ice conditions and not a lack of wind or wave conditions. Also the data must apply to the immediate shore since winds in excess of 30 miles per hour are recorded more frequently than waves in excess of one foot on height. If we consider a point 200 to 300 yards off shore along most of the Lake Huron shore it would be a rare phenomenon when winds in excess of 30 mph occur and the resulting wave didn't exceed one foot. Waves ranging in heights up to one foot are normal for Lake Huron. We suggest that the assumptions made and the intended use of the data be specified on this plate so as to minimize misunderstanding.

Plate 2-10 Interstate Highway System Lake Huron, Basin on page 2-20 has several of the highways mislabled.

Another general observation is that cities and/or locations cited in the text are not located on the accompanying maps.

Sincerely yours,

VERNON G. GOELZER
Chief, Engineering Division

(Signature)
P. M. McAllister

1 Incl
As stated

C DEPARTMENT OF THE ARMY
O LAKE SURVEY DISTRICT, CORPS OF ENGINEERS
P 630 Federal Building
Y Detroit, Michigan 48226

In Reply Refer To

NCLTL

27 October 1967

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

As requested in your letter to this office dated October 13, 1967, the preliminary draft of your report, "Water-Oriented Outdoor Recreation -- Lake Huron Basin," has been reviewed.

The report appears to be excellent with a few relatively minor exceptions:

The land portion of the drainage basin given on page 2-1, paragraph 1, exceeds the value adopted by the International Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data by 150 square miles. The difference may result from the use of different limits.

The symbols for water and air temperatures shown on Plate 2-2, page 2-3, are reversed.

The values given in paragraph 4a check with our values except for the average depth of 208 feet. The value we use at present, given on the "Data on the Great Lakes System," is 195 feet reckoned from low water datum. If reckoned from the mean level of the lake it would be 197 feet. However, the Physical Data Subcommittee of the International Great Lakes Basic Data Committee is re-computing this figure at the present time.

Thank you for allowing us to comment on your report. The Lake Srrvey will welcome the opportunity to assist you in any way possible.

Sincerely yours,

(Signature)
JAMES E. BUNCH
Lt. Colonel, Corps of Engineers
District Engineer

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UNITED STATES GOVERNMENT
MEMORANDUM DATE: November 21, 1967

TO: Regional Director, Lake Central Region, BOR
Ann Arbor, Michigan

FROM: River Basin Studies Coordinator, BCF
Ann Arbor, Michigan

SUBJECT: Lake Huron Basin Report

We have reviewed the subject report enclosed with your October 13 memorandum. Other than the few minor comments listed below, we felt the report was well done and appreciate the opportunity for review.

p. 2-7, line 8, 10 - sea lamprey misspelled
p. 2-7, line 9 - decline of the cisco is not directly attributable to lamprey invasion
p. 3-5, line 3 - appendix misspelled
p. 4-13, line 10 - the phrase "unknown sources of pollution" is not clear in this context
p. 7-1, line 15 - Although lamprey control appears to have been successful in Lakes Michigan and Superior, treatment has not yet begun in Lake Huron. It may be assumed from this sentence that the lamprey will be controlled in Lake Huron in the near future whereas it will be at least 8-10 years before results are apparent.

ROBERT L. SCHUELER

(Signature)
JOHN K. SULLIVAN

Enclosures

C UNITED STATES
O DEPARTMENT OF THE INTERIOR
P FISH AND WILDLIFE SERVICE
Y BUREAU OF SPORT FISHERIES AND WILDLIFE
1006 West Lake Street
Minneapolis, Minnesota 55408

In Reply Refer To

RB

January 30, 1968

Memorandum

To: Regional Director, Bureau of Outdoor Recreation, USDI
Ann Arbor, Michigan

From: Acting Regional Director, Bureau of Sport Fisheries and Wildlife, USDI, Minneapolis, Minnesota

Subject: Lake Huron Report - Great Lakes-Illinois River Basin Study

We have received Draft 2 of your report Water-Oriented Outdoor Recreation in the Lake Huron Basin.

As requested in your December 22, 1967 memorandum, our comments on this revised draft were provided by telephone in a January 29 call from Mr. Vogtman to Mr. Hollenbaugh of your office. Although our review has been limited to fish and wildlife considerations, we were impressed by the scope of the report and the great amount of material it contains.

We appreciate this review opportunity.

(Signature)
W. P. SCHAEFER

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
1006 West Lake Street
Minneapolis, Minnesota 55408

In Reply Refer to

RB

December 3, 1968

Memorandum

To: Regional Director, Bureau of Outdoor Recreation
Ann Arbor, Michigan

From: Regional Director, BSFW, Minneapolis, Minnesota

Subject: Review of Revised Conclusions and Recommendations
Lake Huron Report (GLIRB)

We have reviewed your conclusions and recommendations and consider them complete in their coverage of the recreation problems of Lake Huron. We have the following review comments:

> Recommendation 2b seems unnecessary, since generous financial assistance programs already exist. (Refer to: "Federal Assistance in Outdoor Recreation - Available to: States, their Subdivisions, Organizations, and Individuals", published by the Department of the Interior, Bureau of Outdoor Recreation). However, more emphasis should be given to publicizing the existence of these assistance programs.
>
> In Recommendation 3, we would favor "review" rather than "adopt", in line 2, since numerous regulations already exist and there is some confusion in this area.
>
> Recommendation 9 makes it appear that control of wastes from summer houses on lakes and streams is a matter of personal discretion. We agree that voluntary community action is desirable, but it should be stressed that pollution laws exist which will be enforced regarding this pollution source if voluntary action is not taken.

We appreciate this review opportunity.

(Signature)
JOHN R. LANGENBACH

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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
1006 West Lake Street
Minneapolis, Minnesota 55408

In Reply Refer To

RB

November 13, 1967

Memorandum

To: Regional Director, Bureau of Outdoor Recreation, USDI
Ann Arbor, Michigan

From: Regional Director, Bureau of Sport Fisheries and Wildlife,
USDI, Minneapolis, Minnesota

Subject: Lake Huron Basin Report - Review of Preliminary Draft
(Koening's Memorandum of 10/13/67)

We have reviewed the subject draft and have the following comments and suggestions:

1. Page i - "Forward" should read "Foreword"
2. Page 3-5, Line 7 - the "quality and quantity of (recreation) facilities" appears here to be a function of only the public agencies. Should the word "private" be added?
3. Page 4-6 Canoeing - One of the qualities or real values of the Au Sable River is the relative feeling of peace and solitude it imparts. Often overlooked in our mad rush for "development" is the equally important need for the more primitive or wilderness aspects of such streams as the Au Sable.
4. Facing Page B-8 - Appendix C - Lake Ontario Basin should read Lake Huron Basin.
5. With reference to the Memorandum of Understanding between the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife (regarding areas of reporting responsibility,) we believe there are several sections of your report which are more properly the province and reporting responsibility of the Bureau of Sport Fisheries and Wildlife.

   We believe the following cited sections from your report belong in the Fish and Wildlife Report:

   a. Page 2-7 - Paragraph 1, 2, 3, and 4
   b. Page 3-4 - Plate 3-1 - Demand for fishing and hunting activities
   c. Pages 4-29-32 - Subsection (F) Hunting
   d. Page 6-4 - paragraph 1

e. Page 6-5 (Table 6-1) - Natural resources references
f. Page 7-1 - Paragraph 2 - Great Lakes Sport Fishery
g. Page 7-3 - Paragraph B-2. The last two sentences related to fish and wildlife, with last sentence constituting a wildlife recommendation.

The entire content of Chapter 6 - "Water Quality Influences" goes rather heavily into pollution control and the effects of pollution on the natural environment. This is one of the principal areas which will be covered in the Fish and Wildlife Report. To avoid conflict and possible duplication in our reporting, we believe that water quality aspects of the basin should be oriented more towards other water uses, with a considerably more limited review of the natural resource--water quality relationships.

We recognize that in the preparation of the Great Lakes Reports, close coordination between all cooperating agencies is difficult. For future Great Lakes reporting, we suggest that coordination be effected early in each reporting effort, preferably between the individuals in our two agencies who are assigned the reporting responsibility. This should help us avoid overlap and possible conflicts in our efforts.

We appreciate this opportunity to review the Lake Huron report draft. We were also pleased to have the opportunity last week to review some of our mutual problems with Messrs. Nelson and Otis. If there is anything we can do to further improve our interagency coordination, please be sure to call on us.

We are returning two copies of the subject report draft.

(Signature)
R. W. BURWELL

Enclosures: 2

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DI,FWPCA, GREAT LAKES REGION

UNITED STATES GOVERNMENT
MEMORANDUM

DATE: November 15, 1967

To: Roman H. Koenings, Regional Director
Lake Central Region, Bureau of Outdoor Recreation

From: Regional Director

Subject: Lake Huron Basin Report (Your Reference: D 6427 GL)

As requested in your memorandum of October 13, 1967, we have reviewed the Lake Huron Basin Report and have the following comments or suggestions.

Generally, the report is well written and informative and it should prove useful to us and to other agencies interested in the control and prevention of water pollution and in advancing the cause of water oriented outdoor recreation.

With reference to projections of recreation demand, if information is available, it would be of value to this agency if it could be estimated what part of the incremental demand in "with opportunity" would result from improved water quality (as distinguished from additional or improved facilities or structures.)

Some statements concerning the pollution effects of recreation would strengthen the report, e.g., debris from ice fishing or the discarding of wastes by boaters.

The pinpointing of problem areas is good (Chapter 6). It would be helpful if some statement was made as to whether these areas constitute the major and majority of such areas or whether they are merely representative.

On page 1-3: Suggest deleting the definition for improved water quality. As the definition is worded some very "bad" water might be greatly improved and still not qualify because of failure to meet criteria for whole body contact recreation.

On page 1-4, and 1-5, reference numbers 42, 43 and 29 do not seem to relate to the subject matter of those titles in the bibliography. Also on page 1-4, the definition of recreation demand should, it seems to us, be stronger than expression of interest. This is recognized in later pages of the report. A suggested definition: recreation demand - an expression of the extent to which people would participate in recreation if provided with opportunities at a price they are willing and able to pay.

On page 2-15, line 13 - resident population refers to Table A-1, Appendix A. Table A-1, Appendix A is "Supply Summary."

If available, it would be useful to have a map showing the entire Lake and perhaps some area outside of the Watershed boundary as some of the demand arises from outside of the area.

Page 2-23, does the agricultural population segment pursue less outdoor recreation or does is make use of more private facilities that are not tallied in the surveys?

With reference to Plate 6-7, "Location of Recreational Waters Impaired by Low Quality," does not agree fully with data in our Detroit Program Office reports. For certain stream segments shown as impaired, our Detroit Program Office has no information to confirm the severity. In other areas, streams are shown not impaired or lightly impaired, while our data indicates more severe levels of contaminants. Grossly, Moderately, and Lightly Impaired should be explained and the source and extent of information for Plate 6-7 should be listed. We are enclosing a copy of the Plate with our Detroit Program Office information on impaired water quality added.

Relative to the contaminant "Chlorine" listed on Table 6-1, although toxic to fish when dissolved in water and toxic to humans in the gaseous state, the use of chlorine is currently recommended for disinfection of water supplies and waste effluents, and it is doubtful the Federal Water Pollution Control Administration would ordinarily designate it as a contaminant. It is possible that the ion "chloride" (and other salts) was intended to be the contaminant.

Chapter 7, in Section C, Action Programs (pg 7-5), other programs of the Corps of Engineers such as comprehensive studies, flood plain studies, harbor and river dredging might be mentioned as they pertain to recreation.

The enclosed pages list some minor items, mostly editorial in nature, for you consideration.

(Signature)
H. W. Poston

Enclosures

STATE OF MICHIGAN

C
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SEAL
GEORGE ROMNEY, GOVERNOR

DEPARTMENT OF CONSERVATION
Ralph A. Mac Mullen, Director

December 5, 1968

Mr. John D. Cherry
Bureau of Outdoor Recreation
Lake Central Region
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Cherry:

We have reviewed the revised conclusions and recommendations for the report on "Water-Oriented Outdoor Recreation--Lake Huron Basin," transmitted with your letter of November 18, 1968. The following comments are offered for your consideration and action.

> Conclusion 9 - This recommendation does not, in any way, attempt to place in proper perspective the extent of pollution injuries. Our evaluation is that the sentence should read, "... have contaminated limited portion of Lake Huron ..."
>
> Recommendation 6 - State and Federal programs and facilities are constantly under review and surveillance. At the present time, our staff is preparing recommendations for FWPCA concerning the adequacy of waste control facilities for all Federal installations in Michigan.
>
> Recommendation 7b - We believe that research has shown several economical methods for nutrient (phosphorus) removal and Michigan communities and industries have been notified that phosphorus removal facilities must be in operation in accordance with certain prescribed time schedules. These time schedules vary but range from 1970 to 1977 for startup of phosphorus removal facilities. State and Federal authorities do not believe that removal of nitrogen compounds from waste waters is practical at the present time nor do they believe that water quality would be enhanced to a significant degree by the reduction or removal of this constituent.

Recommendation 8 - The oil and gas producing industry is already undertaking a study to find methods to eliminate odors associated with active oil and gas wells.

Thank you for the opportunity to review these conclusions and recommendations. If you have any questions concerning our comments, please let us know.

Very truly yours,

WATER RESOURCES COMMISSION

(Signature)
W. G. TURNEY
Regional Engineer

WGT/ro

cc; Herb Miller
Gerald Eddy

STATE OF MICHIGAN
SEAL
GEORGE ROMNEY, GOVERNOR
DEPARTMENT OF NATURAL RESOURCES
Stevens T. Mason Building, Lansing, Michigan 48926
Ralph A. Mac Mullen, Director

C
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November 29, 1968

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dear Mr. Koenings:

Your letter of November 18, 1968, requesting comments on the attached conclusions and recommendations of your report, "Water-Oriented Outdoor Recreation - Lake Huron Basin," has been received.

Staff members have reviewed this material and offer the following changes:

Conclusion No. 6 We propose substituting the following: Seasonal and vacation homes contribute substantially to utilization of recreational opportunities offered by the land and water resources. The extent of their development on many lakes and streams, however, reduces the opportunity for public projects, and public access to water is a distinct problem in some areas. In addition, considerable acreage of private land formerly accessible to hunters is being fenced off to the public, much of it through the formation of private hunting clubs.

Conclusion No. 12 We are of the opinion that this statement is incorrect. Malodorous natural gas vapors associated with active oil wells are limited to a small segment of the basin near West Branch and St. Helen. These areas of some 160 oil fields in the Huron Basin are not in our opinion ".... present at various locations throughout a sizeable portion of the basin." Should you wish additional information on this point, the Geological Survey Division would be pleased to assist your people.

Conclusion No. 14 We recommend that the report identify special problem areas with excessive algae and weed growth within the basin or providing the reader with some idea as to the scope of the problem. Without clarification the general statement colors the true picture.

Recommendation No. 4 We propose altering this statement. Both flood plain protection and shoreline protection is afforded by controls administered by the Department under authority of recent legislation. Reference should be made to Act 247, P.A. 1955, as amended; Act 291, P.A. 1965, as amended; Act 288, P.A. 1967, and Act 167, P.A. 1968 (copies attached). We recommend citing the Acts.

Recommendation No. 8 It would be proper to point out that the oil and gas producing industrialists are aware of the problems of unpleasant odors associated with oil and gas production activities and report that the major companies are presently involved in joint research efforts to minimize or eliminate natural gas odors as an air pollutant. The Geological Survey Division can provide further details.

Comments regarding water pollution and water quality standards will be received directly from the Executive Director of the Water Resources Commission.

Thank you for providing us with the opportunity to offer comments.

Sincerely,

(Signature)
Ralph A. MacMullen
Director

Attachment

WATER RESOURCES COMMISSION
MEMORANDUM

TO: William Marks

FROM: Ralph W. Purdy

DATE: November 3, 1967

SUBJECT: Bureau of Outdoor Recreation Preliminary Report on "Water-Oriented Outdoor Recreation, Lake Huron Basin"

Page 1-3: Under "Improved Water Quality," "bacteriologically" should be substituted for "biologically."

Page 6-1: Third paragraph, I don't believe that it is correct to assume that there is always an associated bacteriological contamination with increasing nutrient concentrations. An effluent from a waste treatment plant can be properly chlorinated, yet contain nutrients. Also, land runoff will contain nutrients and not have bacteriological contamination.

Page 6-2: Second paragraph. Throughout this entire report there seem to be a great deal of emphasis placed on faulty individual septic systems being responsible for large-scale degradation of lake and river water quality. I am wondering what substantive evidence supports this conclusion.

Page 6-3: Second paragraph. Under "Swimming." Again, I wonder what evidence is available to support the conclusion made.

Page 6-9: The asterisk on Table 6-2. Although the beach was posted as stated, it should also be noted that the beach was posted in error. The water samples did not support the action of the county health department in its premature closing of this beach.

Page 6-9: First paragraph under "Alpena." Proposed standards formulated by the Water Resources Commission are not accurately quoted. Also, it should be noted that arithmetical averages were apparently used in handling the coliform data for the two beaches. This places an undue amount of emphasis on single high samples. It is generally conceited that arithmetical averages cannot be used in the handling of coliform data. In addition, I believe the information used was obtained from our records. It has since been determined that the technician that made the coliform determinations on the samples collected on 6-23-66 did not perform the analytical techniques properly and that the high values shown on this date are incorrect. When the above is taken into account, the conclusions reached must be substantially different.

Page 6-11: Under "Harbor Beach." Studies have been made which show that the high coliform count is due to coliform contained in the discharge from the industry. It also has been shown that all sanitary waste from the industry is discharged into the municipal system for treatment, therefore, the coliform from the industry is not attributable to human waste. The above makes their conclusions or assumptions, which they have stated as not being scientifically founded, incorrect.

Page 6-12: First paragraph. When they state, "Effluent from an inefficient primary treatment plant," this leads me to believe that the primary treatment plant is not being properly operated. I wonder if this is the intent or whether they mean to imply that the primary treatment plant is, in their opinion, an inefficient treatment device.

Second paragraph. It is suggested that storm water might be diverted to retention ponds. I am wondering what might be accomplished by this in the way of nutrient removal. Certainly if the ponds overflowed to the watercourse, it would accomplish nothing in the way of nutrient removal. Secondly, they have reached a conclusion that nutrients placed in the ground by septic tank systems travel through the ground waters to the lake. If this conclusion is correct, then I would expect that it would also be correct for the seepage from the storm water retention pond.

Page 6-16: Streams designated as being impaired on this map should be checked with the recent evaluation of impaired streams made by John Bohunsky's section, in particular, as they relate to municipal waste problems.

Page 8-2: Conclusion number 9. Again, I believe the problems caused by septic tank systems are being over emphasized.

C GENESSEE COUNTY METROPOLITAN
O PLANNING COMMISSION
P 930 Beach Street
Y Flint, Michigan 48502

November 21, 1967

Mr. Roman H. Koenings
Regional Director
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Subject: D6427GL

Dear Mr. Koenings:

Our staff has reviewed the enclosed preliminary report, "Water-Oriented Outdoor Recreation, Lake Huron Basin," with considerable interest, since recreational facilities will be a significant component of the Comprehensive Land Use-Transportation planning Study currently under way in Genessee County. Realizing the difficulty in collecting and analyzing data for such a large area as the Lake Huron Basin, we commend you for a job well done.

In general, we would suggest the report be more specific on the types of existing and projected needs and demands. An attempt should also be made to provide current population estimates to use as a basis for current demand, rather than using 1960 data. Specific comments and suggestions that we hope will assist you in the preparation of the final report are as follows:

> Page 2-15 -- If possible, an effort should be directed to estimate the current population in the Lake Huron Basin. All resident population data have been derived from the 1960 Census.
>
> Page 2-15 -- Projected population estimates are mentioned for 1990 and 2020. However, the bases for these projections are not cited.
>
> Page 2-18 -- Income per capita for basin residents is based on 1960 data. Since income is indicated as a major factor influencing participation in outdoor recreation, up-to-date figures should be obtained from the Michigan Employment Security Commission, or other sources.

Page 2-19-- A comparison of the basin with other regions should also include a region which has a close association to the basin, such as the State of Michigan. Comparing the basin to the nation only, may not necessarily provide suitable measure of basin conditions.

Page 2-20 -- Plate 2-10 incorrectly locates the Interstate Highway System in Genessee County and southeastern Michigan.

Page 3-3 -- The basis for assuming the number of activities the average person participates in during a visit to a recreation area should be provided.

Page 4-3 -- What is the criteria for locating a local recreation area on Plate 4-2? (Attached is a list of public recreation areas adjacent to water in Genessee County with a map showing their locations.)

Page 4-5 -- Plate 4-3 appears incomplete for Genessee County. This plate should be indexed to facilitate review and comment.

Page 4-6 -- Same comment as for Plate 4-3 above.

Page 4-19 -- Where is the index to Plate 4-10?

Page 4-27 -- Plate 4-19 should be coded to be a greater value to local efforts.

Page 4-35 -- Same comment for Plate 4-24 as for Plate 4-3.

Page 5-1 -- Can any conclusions be drawn from the Michigan Outdoor Recreation Plan which would make Chapter 5 more useful to local units of government reviewing this report?

Page 5-2 -- Table 5-1 appears to be intended to show "present" requirements for developed recreation acreage, however, the information derived from the table is eight years old.

Page 5-3 -- Same comment for Table 5-2 as for 5-1.

Page 6-5 -- Table 6-1 should include possible sources for the various contaminants to be of greater benefits to local agencies reviewing the report.

Page 8-1 -- The figures in conclusion number three conflict with Table A-1 of the Appendix.

Page A-6 -- The proposed recreation area for Genessee County listed in Table A-7 is the Genessee Recreation Area, not the Mott Recreation Area, and it will contain 3800 acres.

Page B-1 -- Are the results of the various reports listed in the second paragraph valid for the Lake Huron Basin?

Thank you for the opportunity to review this report.

Very truly yours,

(Signature)
THOMAS H. HAGA
Director--Coordinator

Attachment